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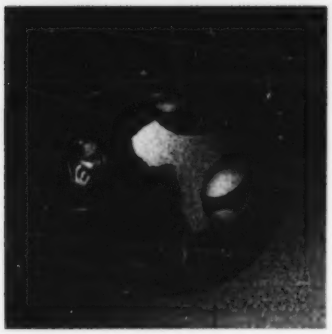
Science, Innovation and Electronic Information Division

Innovation in Information and Communication Technology (ICT) sector service industries: Results from the Survey of Innovation 2003

2001-2003



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^{p} preliminary
^{r} revised
x suppressed to meet the confidentiality requirements of the *Statistics Act*
^{E} use with caution
F too unreliable to be published

Note
Due to rounding, components may not add to the totals.

Statistics Canada
Science and Innovation Surveys Section
Science, Innovation and Electronic Information Division (SIEID)

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2001-2003

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Note of appreciation

Canada owes the success of its statistical system to a long-standing partnership between Statistics Canada, the citizens of Canada, its businesses, governments and other institutions. Accurate and timely statistical information could not be produced without their continued cooperation and goodwill.

The Science and Innovation Information Program

The purpose of this program is to develop **useful indicators of science and technology activity** in Canada based on a framework that ties them together into a coherent picture. To achieve the purpose, statistical indicators are being developed in five key entities:

- **Actors**: are persons and institutions engaged in S&T activities. Measures include distinguishing R&D performers, identifying universities that license their technologies, and determining the field of study of graduates.
- **Activities**: include the creation, transmission or use of S&T knowledge including research and development, innovation, and use of technologies.
- **Linkages**: are the means by which S&T knowledge is transferred among actors. Measures include the flow of graduates to industries, the licensing of a university's technology to a company, co-authorship of scientific papers, the source of ideas for innovation in industry.
- **Outcomes**: are the medium-term consequences of activities. An outcome of an innovation in a firm may be more highly skilled jobs. An outcome of a firm adopting a new technology may be a greater market share for that firm.
- **Impacts**: are the longer-term consequences of activities, linkages and outcomes. Wireless telephony is the result of many activities, linkages and outcomes. It has wide-ranging economic and social impacts such as increased connectedness.

The development of these indicators and their further elaboration is being done at Statistics Canada, in collaboration with other government departments and agencies, and a network of contractors.

Prior to the start of this work, the ongoing measurements of S&T activities were limited to the investment of money and human resources in research and development (R&D). For governments, there were also measures of related scientific activity (RSA) such as surveys and routine testing. These measures presented a limited picture of science and technology in Canada. More measures were needed to improve the picture.

Innovation makes firms competitive and we are continuing with our efforts to understand the characteristics of innovative and non-innovative firms, especially in the service sector that dominates the Canadian Economy. The capacity to innovate resides in people and measures are being developed of the characteristics of people in those industries that lead science and technology activity. In these same industries, measures are being made of the creation and the loss of jobs as part of understanding the impact of technological change.

The federal government is a principal player in science and technology in which it invests over five billion dollars each year. In the past, it has been possible to say only *how much* the federal government spends and *where* it spends it. Our report **Federal Scientific Activities, 1998 (Cat. No. 88-204)** first published socio-economic objectives indicators to show *what* the S&T money is spent on. As well as offering a basis for a public debate on the priorities of government spending, all of this information has been used to provide a context for performance reports of individual departments and agencies.

As of April 1999, the Program has been established as a part of Statistics Canada's Science, Innovation and Electronic Information Division.

The final version of the framework that guides the future elaboration of indicators was published in December, 1998 (**Science and Technology Activities and Impacts: A Framework for a Statistical**

Information System, Cat. No. 88-522). The framework has given rise to **A Five-Year Strategic Plan for the Development of an Information System for Science and Technology** (Cat. No. 88-523).

It is now possible to report on the Canadian system on science and technology and show the role of the federal government in that system.

Our working papers and research papers are available at no cost on the Statistics Canada Internet site at http://www.statcan.ca/cgi-bin/downpub/research.cgi?subject=193.

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Table of Contents

Acknowledgements 8
Executive Summary 9
Preface 11
Introduction 12
The Survey of Innovation 2003 13
1. What is innovation? 15
Rates of innovation 16
Types of innovation 17
Novelty of innovation 19
2. How does innovation take place? 20
Sources of information for innovation 21
Innovation activities 24
Where innovations are developed 25
Innovation collaboration 26
Not yet completed or abandoned innovation activities 28
3. What are the obstacles to innovation and the support programs for innovation? 30
Obstacles to innovation 30
Government Support Programs 34
4. What are the impacts of innovation? 35
5. Why do some establishments choose not to innovate? 36
Appendix I: Description of the information and communication technology (ICT) sector services industries 38
Appendix II: Detailed Data Tables 40
Appendix III: Overview of the ICT sector 56
How to order catalogued publications 62

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Finally, the author would also like to thank the 2,123 selected services establishments who completed the questionnaire. Without their cooperation and goodwill, this working paper would not have been possible.

Executive Summary

Incidence and types of innovation

Seventy-eight percent of establishments in the ICT service sector industries were innovators. The rate of innovators, as a proportion of all establishments, varied from 53% in "Office machinery and equipment rental and leasing" to 100% in "Satellite telecommunications".

Most innovators in the ICT service sector were either product and process innovators (48%) or product-only innovators (44%). Less than 10% of innovators reported process only innovation.

Novelty of innovation

Of all innovative units in ICT service, 40% reported a Canada-first innovation while 21% reported a world first.

Sources of information

Slightly more than four out of five innovative ICT service establishments identified clients and customers as an important source of information for innovation, more important than any other source of information for innovation.

Innovation activities

Innovative establishments in the ICT service sector were involved in a variety of innovation activities. The most frequently reported innovation activities were internal research and development, training, market introduction of innovations and acquisition of equipment and machinery.

Where are innovations developed?

Both product and process innovators in ICT service industries were more likely to develop innovations mainly within their establishment, than in co-operation with other firms or organizations or mainly within other firms or organizations.

Co-operation and collaboration

While overall 55% of innovative establishments in the ICT service sector reported engaging in cooperative or collaborative arrangements, the propensity to engage in these arrangements varied significantly by industry.

Problems and obstacles to innovation

Economic factors were more frequently identified as important problems or obstacles, than either internal or other factors. The most frequently indicated problem or obstacle to innovation was risk in terms of the innovation's market success, followed by costs of innovation that were too high.

Government support of innovation

R&D tax credits were the most frequently used government program for establishments in ICT service industries followed by government Internet services.

Impacts of innovation

For establishments in ICT service industries, the most frequently indicated impacts of innovation were the ability to adapt flexibly to different client demands, allowing firms to keep up with competitors, and an improved quality of products (goods or services).

Reasons establishments do not innovate

Amongst non-innovative establishments in ICT service industries, the most frequently identified reasons for not innovating during the 2001-2003 period were that they had carried out innovation activities prior to this period, followed by lack of market demand and lack of funds for innovation.

Preface

Innovation and the adoption and dissemination of innovative technologies and practices are vital to economic growth and development. It is through innovation that new products are introduced to the market, new production processes are developed and introduced, and organisational changes are made. Through the adoption of newer, more advanced, technologies and practices, industries are able to increase their production capabilities, improve their productivity, and expand their lines of new goods and services.

In 1993, the first survey of innovation and the adoption of advanced technologies in the Canadian manufacturing sector was carried out. It was followed by a survey of innovation in the communications, financial services and technical business services industries, conducted by the Science, Innovation and Electronic Information Division (SIEID) in 1996. The Survey of Innovation, 1999 surveyed manufacturing industries and, for the first time, selected natural resource support service industries. The Survey of Innovation, 2003 focused on innovation activities in selected service industries, including all of the industries belonging to the information and communication technology (ICT) service sector, as well as selected professional services, selected transportation services and selected natural resource support service industries.

SIEID carried out biotechnology surveys in 1996, 1997, 1999, 2001 and 2003, which examined both the development of new biotechnology products and processes, and the use and planned use of biotechnologies. The Bioproducts Development Survey was also conducted in 2003. The 1999 Survey of Innovation, Advanced Technologies and Practices in the Construction and Related Industries was the first survey of its kind for the construction sector. A number of other surveys have focused on the use and planned use of advanced technologies and practices, including the Surveys of Advanced Manufacturing Technologies (1987, 1989, 1993 and 1998), and surveys on the use and planned use of information and communication technologies, carried out annually since 1999.

This working paper, which highlights innovation in the information and communication technology (ICT) services sector industries, is one of a series of four descriptive working papers which provide an overview of the results of the Survey of Innovation 2003, and is part of a series of products that will present and analyse data from this survey.

Introduction

Innovation may be thought of as the transformation of knowledge into economic activity, a continuum running from invention to commercialization (bringing the new product to the market or the new process to the workplace). From this perspective, innovation performs a vital role, contributing to both economic growth and development. Through innovation, new products are introduced into the marketplace, new production processes are developed and organizational changes are made.

The Information and Communication Technology (ICT) sector is a dynamic component of the Canadian economy, comprising both manufacturing and service industries. The ICT sector accounted for 4.0% of the economy's gross domestic product (GDP) in 1997. It peaked at 5.8% of total economy GDP in 2000, but by 2003, this proportion had dropped slightly to 5.6%. The services component of the ICT sector reported steady growth over this period, from 3.0% of GDP in 1997 to 4.6% by 2003. By contrast, the manufacturing component accounted for 1.0% of total economy GDP in 1997 and peaked at 1.8% in 2000. ICT manufacturing suffered a serious setback in 2001 and by 2003, accounted for only 0.8% of total economy GDP.

Employment in the ICT sector has increased over the 1997-2003 period, largely due to employment growth in ICT service industries. They accounted for 2.6% of total employment in 1997, increasing to 2.9% by 2002. On the other hand, ICT manufacturing industries accounted for 0.9% of total employment in 1997 and just 0.7% in 2002. ICT sector industries also accounted for 41% of all industrial R&D in 2003 (having peaked in 2000 at over 50%), with the manufacturing component accounting for 28% overall, and the services component, 13%. Further information on ICT sector industries can be found in Appendix III[1].

This paper is divided into five sections and three appendices. The first section will examine the nature of innovation. The second will describe how innovation takes place. The third section will explore factors that may affect the decision to innovate such as obstacles and incentives. The fourth section will examine the impacts of innovation. The fifth section will look at why some firms choose not to innovate. Finally, three appendices will provide an official description for each of the ICT service industries covered in this paper, tables containing estimates with reliability measures for all data included in this paper and an overview of selected ICT service industries in terms of their contributions to GDP, employment and R&D spending.

1. See also: Statistics Canada (2001a), *Beyond the information highway: Networked Canada*, Catalogue No. 56-504-XIE. Ottawa: Statistics Canada, Statistics Canada (2001b), *Information and Communications Technologies in Canada: A statistical profile of the ICT sector*, Catalogue No. 56-506-XIE. Ottawa: Statistics Canada and Statistics Canada (2003), *Canada's Journey to an Information Society*, Catalogue No. 56-508-XIE. Ottawa: Statistics Canada.

The Survey of Innovation 2003

The data used in this paper are from the Survey of Innovation 2003. The Survey of Innovation 2003 is the first survey of innovation in Canada to examine ICT service industries, transportation industries and natural resource support service industries.

This survey was conducted pursuant to the guidelines set out in the Oslo Manual[2]. The target population for the Survey of Innovation 2003 was establishments operating in Canada in selected service industries including all ICT[3] industries in the service sector; selected knowledge-based "Professional, scientific and technical services" industries; selected industries serving mining and/or forestry or forest products; and selected "Transportation industries". To reduce the response burden on small businesses, only establishments with at least 15 employees and at least $250,000 in revenues[4] were considered in sample selection[5].

The questionnaire was directed to establishments. "The establishment is the level at which the accounting data required to measure production is available (principal inputs, revenues, salaries and wages). The establishment, as a statistical unit, is defined as the most homogeneous unit of production for which the business maintains accounting records from which it is possible to assemble all the data elements required to compile the full structure of the gross value of production (total sales or shipments, and inventories), the cost of materials and services, and labour and capital used in production."[6] In the questionnaire, establishments were referred to as "business units" as this terminology was found to be more familiar to respondents completing the survey. Establishments were also asked whether or not they belonged to larger firms, which corresponds to the statistical concept of the enterprise.

The ICT sector is defined by international agreement[7] to include selected industries from the manufacturing and service sectors. The Survey of Innovation 2003 included all of the service industries that comprise the ICT sector. Specifically, fifteen ICT service industries were sampled, with 1,359 sampled establishments representing 4,504 establishments. Table 1 contains a detailed breakout of population, sample and response rate by industry.

---

2. OECD/Eurostat (1997), *Proposed Guidelines for Collecting and Interpreting Technological Innovation Data (Oslo Manual)*. Paris: OECD
3. The definition of Information and communications technology (ICT) industries is found on the Statistics Canada web site: http://www.statcan.ca/english/Subjects/Standard/spec-aggreg/ict-2002/ict02-menu.htm.
4. Revenues and number of employees were obtained from Statistics Canada's Business Register, December 2002.
5. Details on the Survey of Innovation 2003 are available on the Statistics Canada web site: http://www.statcan.ca/english/sdds/4218.htm
6. Source: http://www.statcan.ca/english/concepts/stat-unit-def.htm
7. The industry-based definition of the ICT sector was developed in 1998 by member countries of the Organization of Economic Co-operation and Development (OECD), under work carried out by the Working Party on Indicators for the Information Society (WPIIS).

Table 1: Population, sample and response rate for selected ICT service industries

NAICS (2002)	Description	Population	Sample	Response rate (%)
ICT	**ICT Services**	**4,504**	**1,359**	--
4173	Computer and Communications Equipment and Supplier Wholesaler-Distributors	701	197	55.6
41791	Office and Store Machinery and Equipment Wholesalers-Distributors[8]	381	99	--
5112	Software Publishers	357	141	68.3
5171	Wired Telecommunications Carriers	136	82	32.4
5172	Wireless Telecommunications Carriers (except Satellite)	82	63	45.5
5173	Telecommunications Resellers	48	41	46.4
5174	Satellite Telecommunications	18	18	64.3
5175	Cable and Other Program Distribution	157	102	64.5
5179	Other Telecommunications	4	4	100.0
518111	Internet Service Providers	132	78	63.3
518112	Web Search Portals	9	9	100.0
5182	Data Processing, Hosting, and Related Services	113	72	71.4
53242	Office Machinery and Equipment Rental and Leasing	27	22	87.5
54151	Computer Systems Design and Related Services	2,178	338	65.8
8112	Electronic and Precision Equipment Repair and Maintenance	161	93	70.3

Source: *Statistics Canada, Survey of Innovation 2003*

This working paper will present information on individual ICT service industries and/or "total ICT sector services" where there are too many variables to provide detail by industry. For detailed information on all variables for ICT service industries, see the CD-ROM entitled *Survey of Innovation 2003: Statistical Tables for Selected Service Industries*, Catalogue No. 88-524-XCB.

8. Note that no response rate can be calculated for this industry because the sampling plan was based on 4179 not 41791. The other three industries in 4179 are not part of the ICT service sector.

1. What is innovation?

Innovation combines invention and discovery with practical application, either by bringing the invention to the market or to the workplace. The Oslo Manual (OECD/Eurostat 1997) outlines proposed guidelines for collecting and interpreting innovation data and allows the production of internationally comparable, meaningful indicators of innovation. The manual identifies two types of technological innovation — product innovation and process innovation.

An innovative firm is one that has introduced a new or significantly improved product onto the market or introduced a new or significantly improved process into the production process during the previous three years.

In the case of product innovation, the product must be new to the establishment and it must have been introduced to the market, and not simply be ready for introduction to the market. The term "product" includes both goods and services. Complex products may be innovative as a result of changes to one of the components or subsystems. Changes to a firm's existing products that are purely aesthetic, or that involve only minor modifications, are not considered to be innovations.

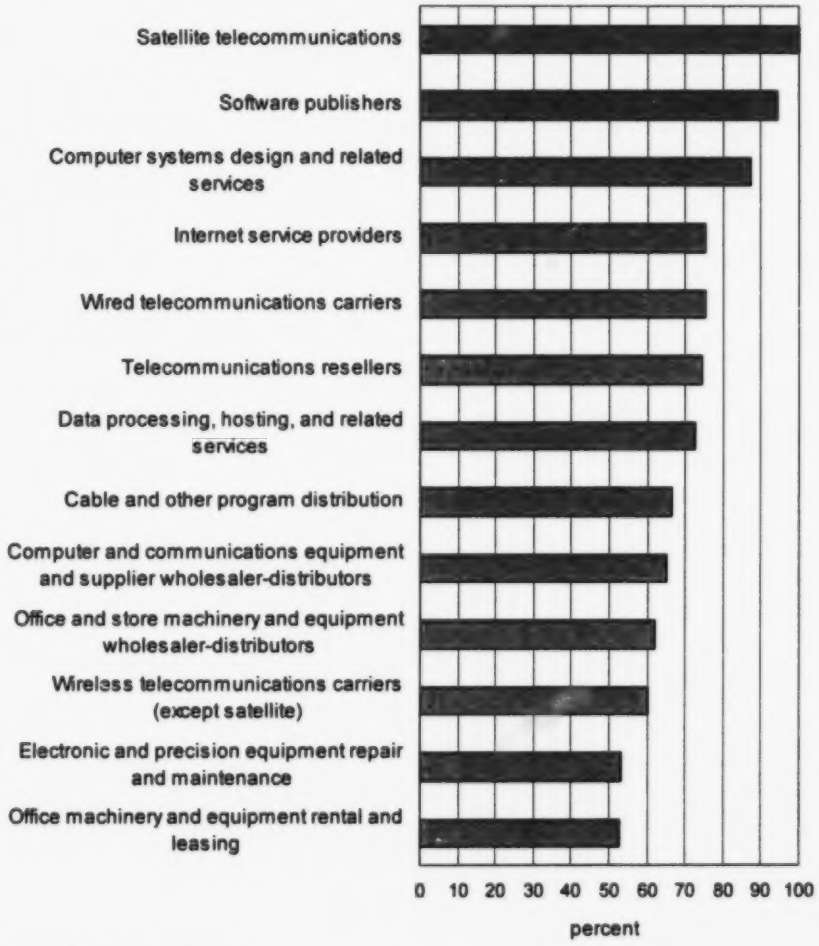
A process innovation must have been actually used within the production process. New or significantly improved processes are those that are new to the firm. The outcome of process innovation should be significant with respect to the level of output, quality of products (goods or services) or costs of production and distribution. Minor or routine changes to processes are not to be included. The term "process" also includes improved ways of delivering goods or services.

This section will look at the percentage of innovators, the types of innovations being undertaken and the degree of novelty of innovations in information and communications technology industries in the service sector.

Rates of innovation

For ICT service industries as a whole 78.2% of the establishments are innovative. More than one half of all establishments in each of the ICT service industries[9] were innovative, ranging from 53% in "Office machinery and equipment rental and leasing" to 100% in "Satellite telecommunications".

Figure 1
Percentage of innovative establishments, 2001 to 2003


Satellite telecommunications
Software publishers
Computer systems design and related services
Internet service providers
Wired telecommunications carriers
Telecommunications resellers
Data processing, hosting, and related services
Cable and other program distribution
Computer and communications equipment and supplier wholesaler-distributors
Office and store machinery and equipment wholesaler-distributors
Wireless telecommunications carriers (except satellite)
Electronic and precision equipment repair and maintenance
Office machinery and equipment rental and leasing
0 10 20 30 40 50 60 70 80 90 100
percent

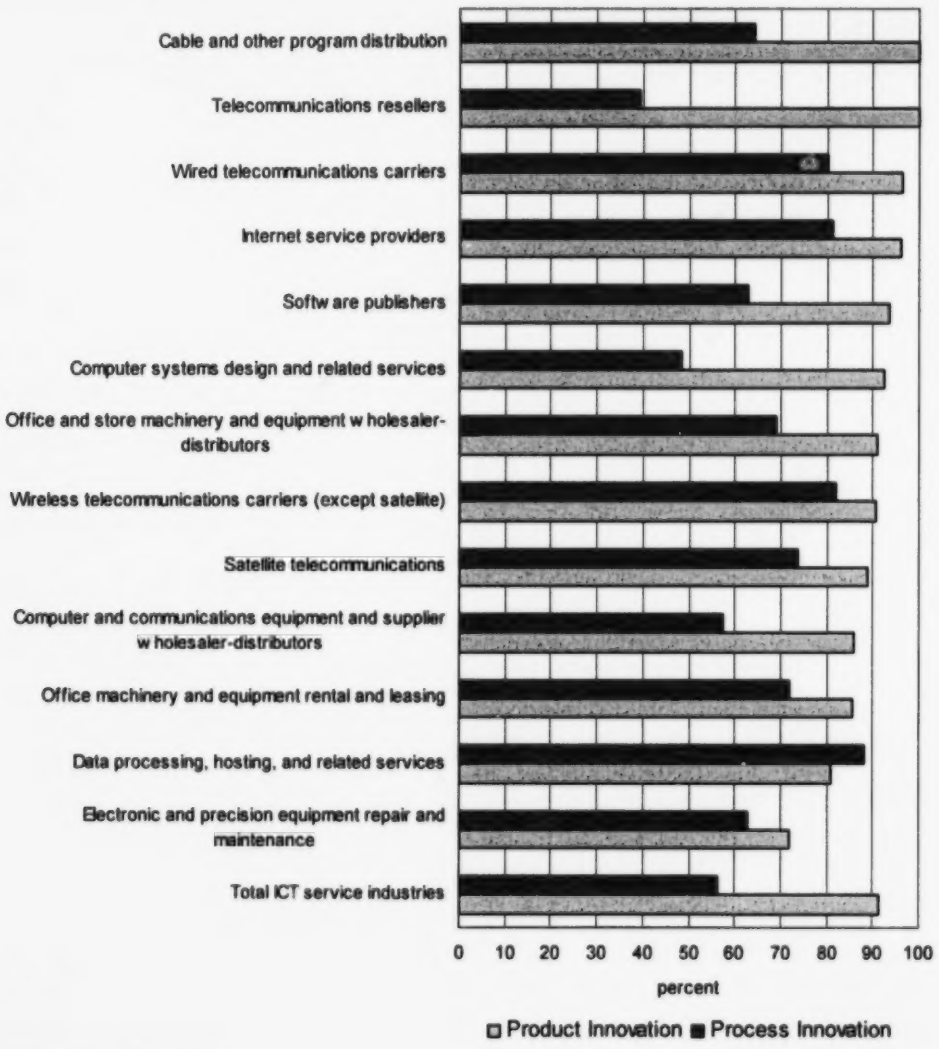
Source: *Appendix II, table 1A*

9. Note that due to reasons of confidentiality, data are not available for two ICT service industries – "Other telecommunications" (NAICS 5179) and "Web search portals" (NAICS 518112). All subsequent tables and graphs will not include these industries.

Types of innovation

In 12 of the 13 ICT service industries for which reliable data are available, innovators were more likely to develop product innovations than process innovations (Figure 2). The exception was "Data processing, hosting and related services" where there were slightly more establishments engaged in process innovation than product innovation.

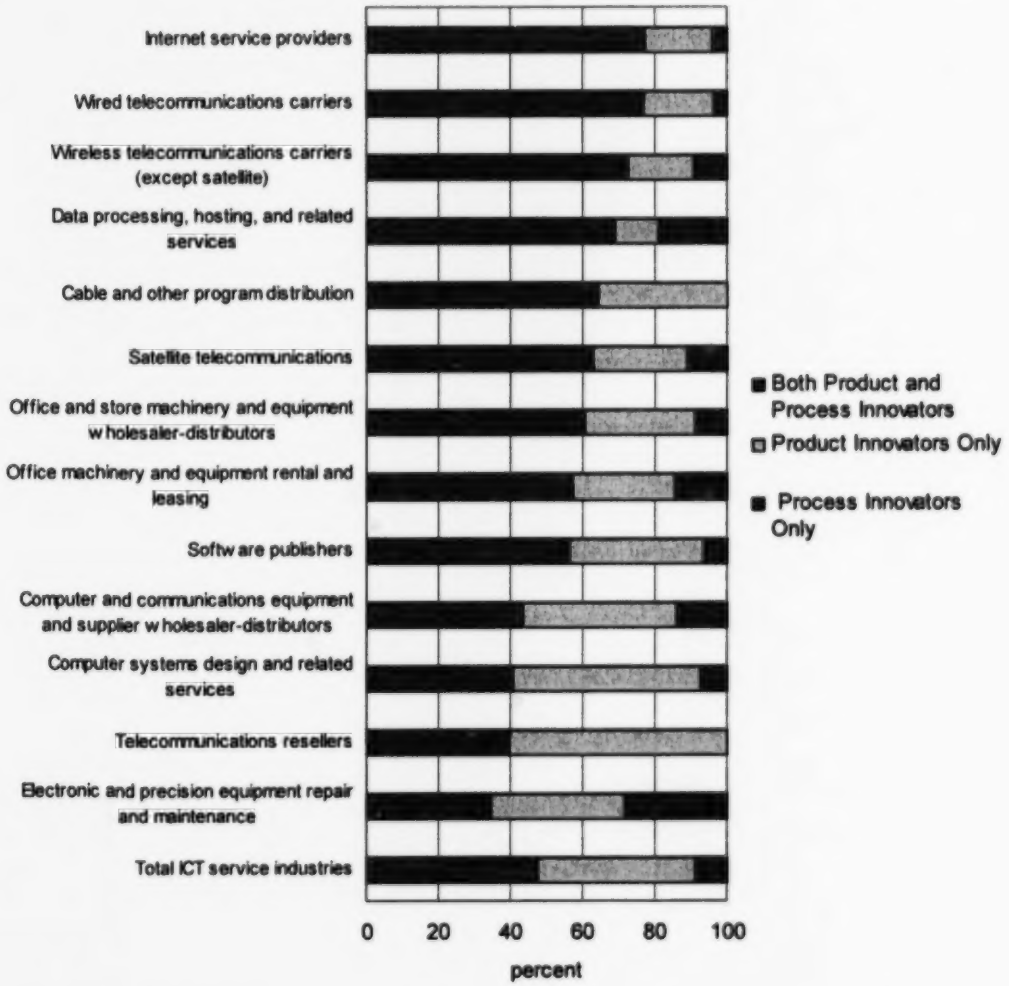
Figure 2
Percentage of innovative establishments engaged in product and process innovation, 2001 to 2003


Cable and other program distribution
Telecommunications resellers
Wired telecommunications carriers
Internet service providers
Softw are publishers
Computer systems design and related services
Office and store machinery and equipment w holesaler-distributors
Wireless telecommunications carriers (except satellite)
Satellite telecommunications
Computer and communications equipment and supplier w holesaler-distributors
Office machinery and equipment rental and leasing
Data processing, hosting, and related services
Electronic and precision equipment repair and maintenance
Total ICT service industries
0 10 20 30 40 50 60 70 80 90 100
percent
Product Innovation
Process Innovation

Source: *Appendix II, table 2A*

When examined in terms of the three types of innovators (product only, process only or both product and process), there were close to the same proportions of product only innovators and both product and process innovators (Figure 3). In nine of 13 industries for which data are available, one half or more of all innovative establishments engaged in both product and process innovations.

Figure 3
Percentage of product only, process only, and both product and process innovators amongst innovative establishments, 2001 to 2003



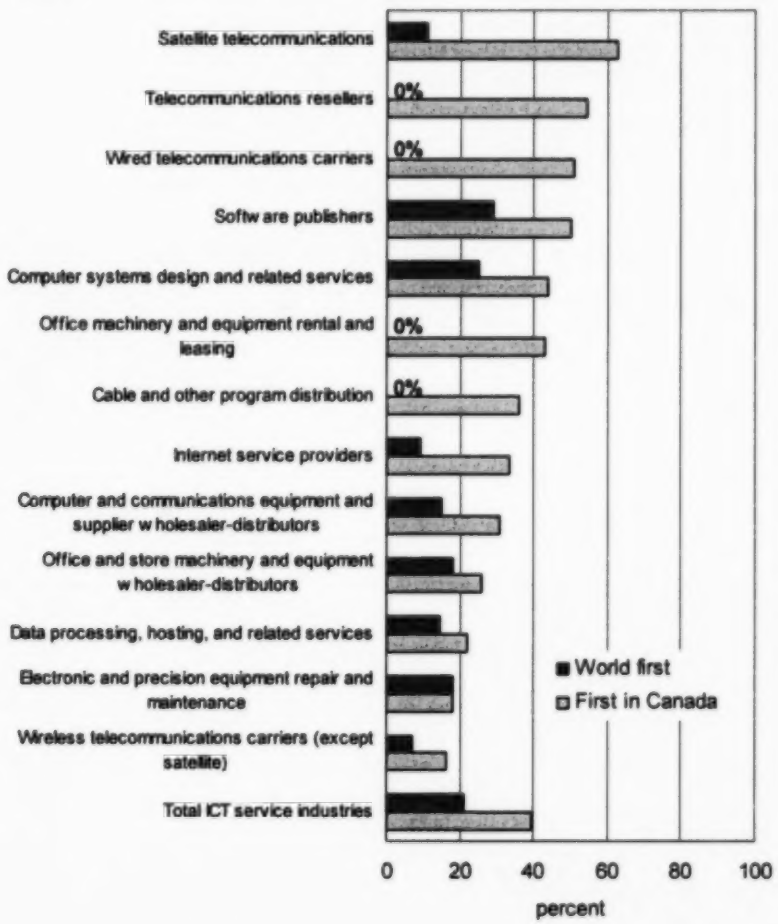
Source: *Appendix II, table 2A*

Novelty of innovation

Of all innovative units in ICT services, 40% reported a Canada-first innovation while 21% reported a world first (Figure 4).

At least half of all innovative establishments in four industries, "Satellite telecommunications", "Telecommunications resellers", "Wired telecommunications carriers" and "Software publishers", reported Canada-first innovations while two industries, "Computer systems design" and "Software publishing", reported 25% or more establishments with world-first innovations.

Figure 4
Percentage of innovative establishments reporting Canada first or world first, new or significantly improved products (goods or services) and/or processes, 2001 to 2003



Source: *Appendix II, table 3A*

2. How does innovation take place?

This section examines how innovation takes place. It will examine four aspects of innovation: sources of information, innovation activities, who develops innovations and the propensity to engage in cooperative and collaborative arrangements in order to develop innovation.

Sources of information needed for suggesting or contributing to the development of new or significantly new products or processes may be located within the firm or outside it. The sources outside may arise from working relationships of the firm with its clients, suppliers, consultants, various laboratories and so on. Finally, the information may be generally available to the public.

Innovation can involve a broad range of activities, including engaging in R&D inside the firm, obtaining R&D performed outside the firm, acquisition of equipment and machinery as well as training and market introduction of innovative products.

Innovations can be developed mainly from within the establishment (including the firm the establishment is part of), they can be developed in co-operation with other firms or organizations or they can be developed mainly by other firms or organizations.

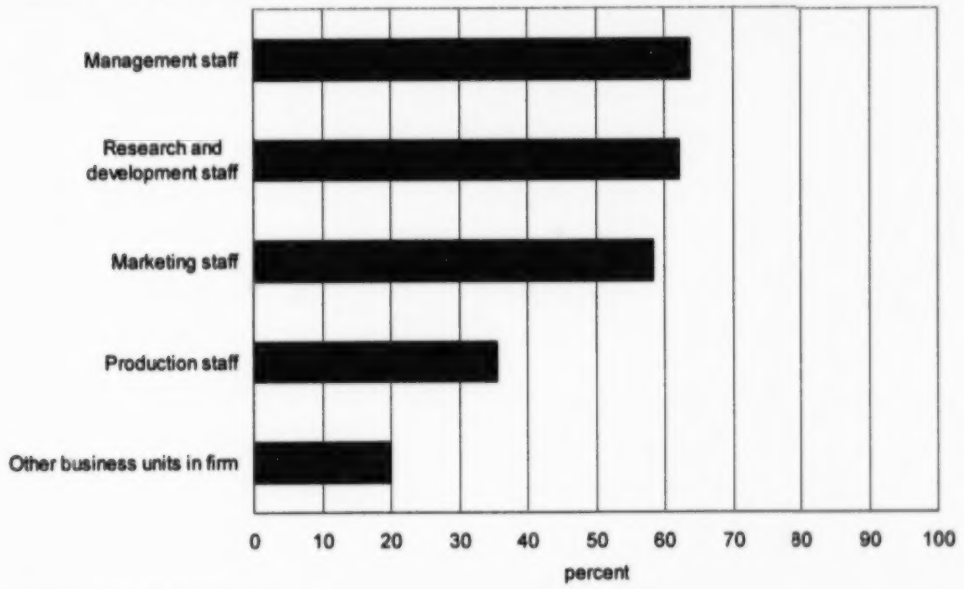
Establishments may choose to engage in cooperative or collaborative arrangements to innovate. These arrangements involve the active participation in joint projects between the establishment and other firms and organizations in order to develop new or significantly improved products or processes. Pure contracting out of work, where there is not active collaboration, is not regarded as co-operation.

Sources of information for innovation

Establishments were asked to indicate which sources of information played an important role needed for suggesting or contributing to the development of innovations during the period 2001 to 2003 (Figures 5, 6 and 7). Amongst all innovative establishments in ICT services, clients and customers were indicated by 81% of establishments as an important source of information for innovation, more than any other source of information.

Management staff, R&D staff and marketing staff were the most frequently indicated important internal sources of information on innovation within the establishment (Figure 5).

Figure 5
Percent of innovative establishments in ICT services indicating that the internal source of information played an important[10] role needed for suggesting or contributing to the development of innovations during the period 2001 to 2003

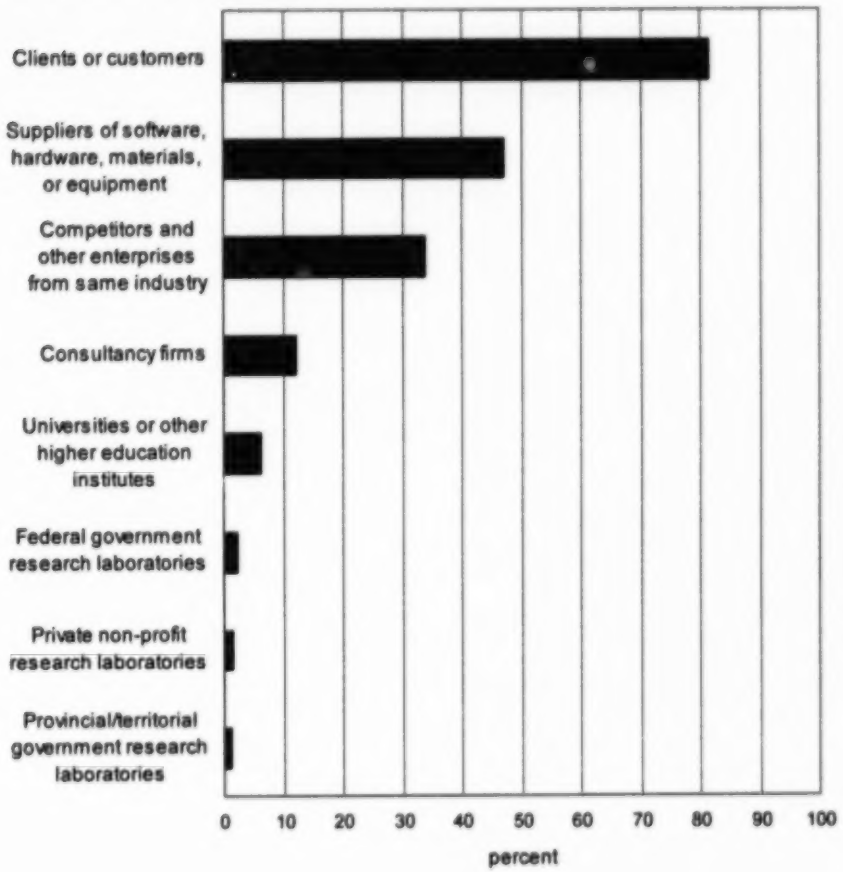


Source: *Appendix II, table 4A*

10. Respondents were asked to indicate the importance using a scale of 1 to 5, where 1 is low importance and 5 is high importance. "Important" in the descriptive text portion of this document indicates a response of "4" or "5". In the tables that follow, "High" indicates a response of "5" and "Moderately high" indicates a response of "4". Respondents could also indicate "0", which indicated the factor was not relevant.

Customers and clients were the most frequently indicated external source of information, followed by suppliers of hardware, software, materials or equipment and competitors in the same industry (Figure 6).

Figure 6
Percent of innovative establishments indicating that the external source of information played an important[11] role needed for suggesting or contributing to the development of innovations, 2001 to 2003

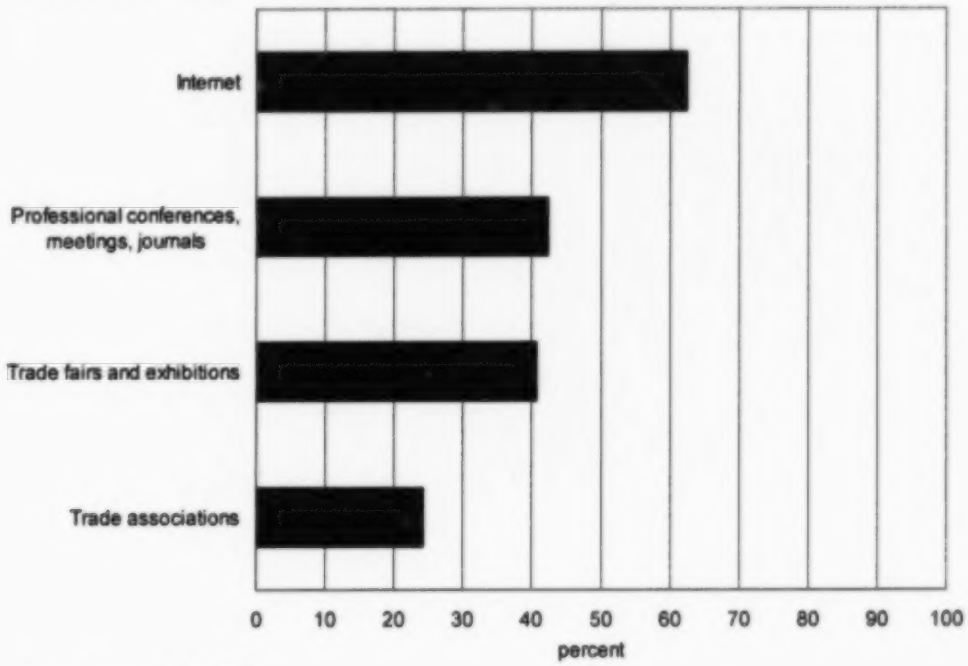


Source: *Appendix II, table 4A*

11. Respondents were asked to indicate the importance using a scale of 1 to 5, where 1 is low importance and 5 is high importance. "Important" in the descriptive text portion of this document indicates a response of "4" or "5". In the tables that follow, "High" indicates a response of "5" and "Moderately high" indicates a response of "4". Respondents could also indicate "0", which indicated the factor was not relevant.

The Internet was the most frequently indicated amongst the "other" sources of information, followed by professional conferences, meetings, journals and trade fairs and exhibitions (Figure 7).

Figure 7
Percent of innovative establishments indicating that the other sources of information played an important[12] role needed for suggesting or contributing to the development of innovations during the period 2001 to 2003



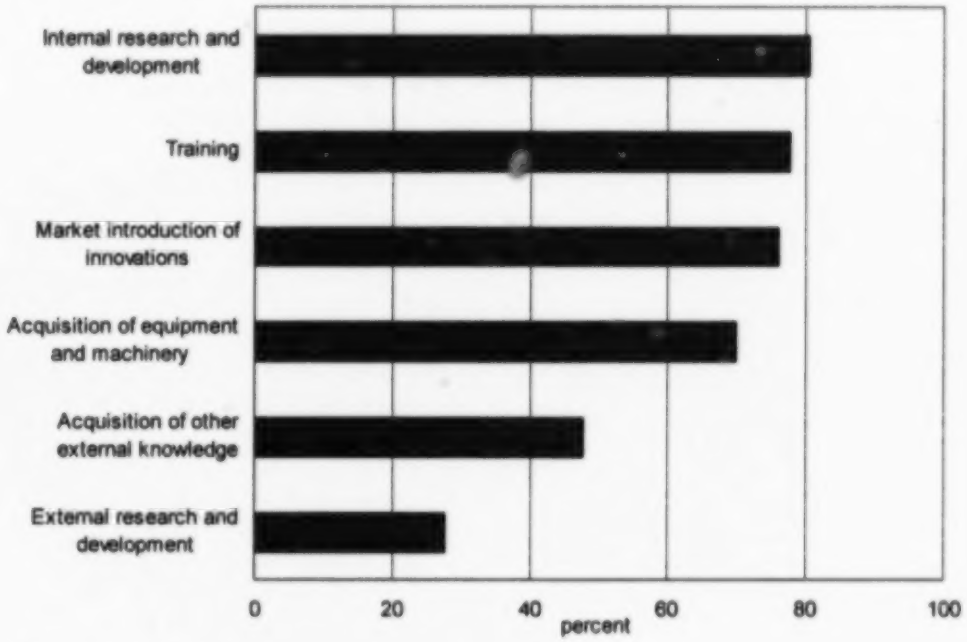
Source: *Appendix II, table 4A*

12 Respondents were asked to indicate the importance using a scale of 1 to 5, where 1 is low importance and 5 is high importance. "Important" in the descriptive text portion of this document indicates a response of "4" or "5". In the tables that follow, "High" indicates a response of "5" and "Moderately high" indicates a response of "4". Respondents could also indicate "0", which indicated the factor was not relevant.

Innovation activities

Innovative establishments were asked to indicate their participation in a series of six innovation activities. Innovative ICT services establishments engaged in a variety of innovation activities. The most frequently indicated innovation activities were internal research and development, training, market introduction of innovations and acquisition of equipment and machinery (Figure 8).

Figure 8
Percent of innovative establishments engaged in activities linked to product or process innovation, 2001 to 2003

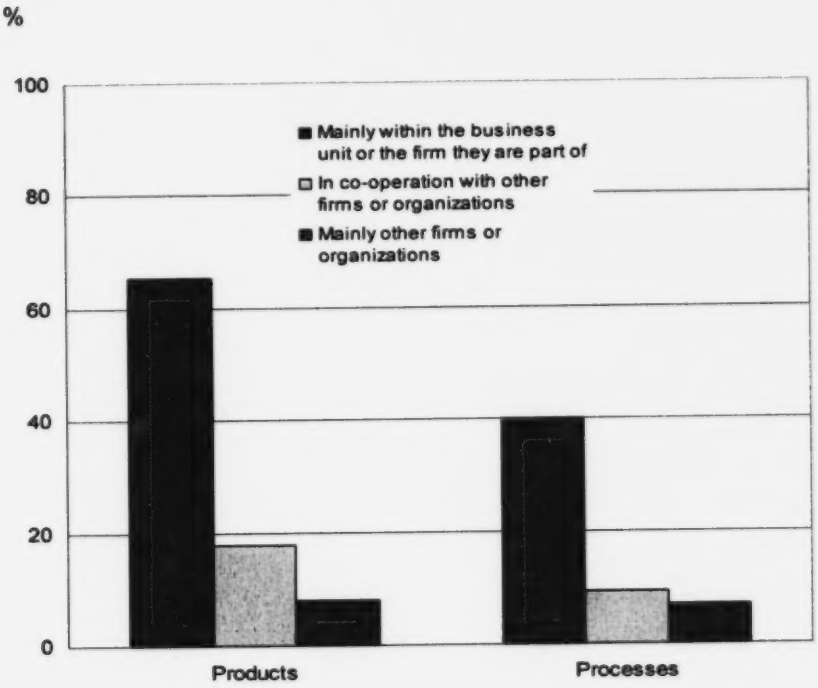


Source: *Appendix II, table 5A*

Where innovations are developed

Both product and process innovators in ICT service industries were more likely to indicate that they developed their innovations mainly within their establishment than in co-operation with other firms or organizations or mainly within other firms or organizations (Figure 9).

Figure 9
Percent of innovative establishments indicating who developed their product and process innovations that were introduced, 2001 to 2003

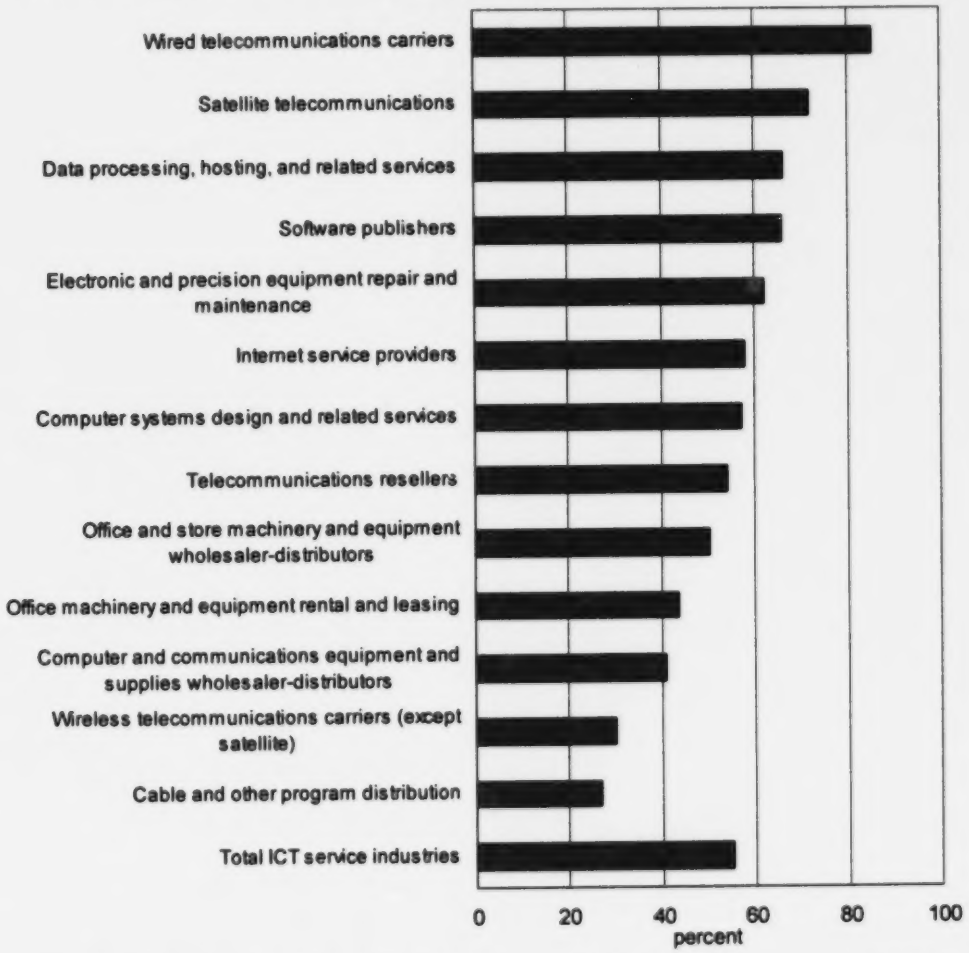


Source: *Appendix II, table 6Aand 7A*

Innovation collaboration

While overall 55% of all innovative establishments in ICT service industries reported engaging in cooperative or collaborative arrangements, the propensity to engage in these arrangements varied significantly by industry with "Wired telecommunications carriers" reporting the highest level of collaboration followed by "Satellite telecommunications", "Data processing, hosting and related services" and "Software publishers"(Figure 10).

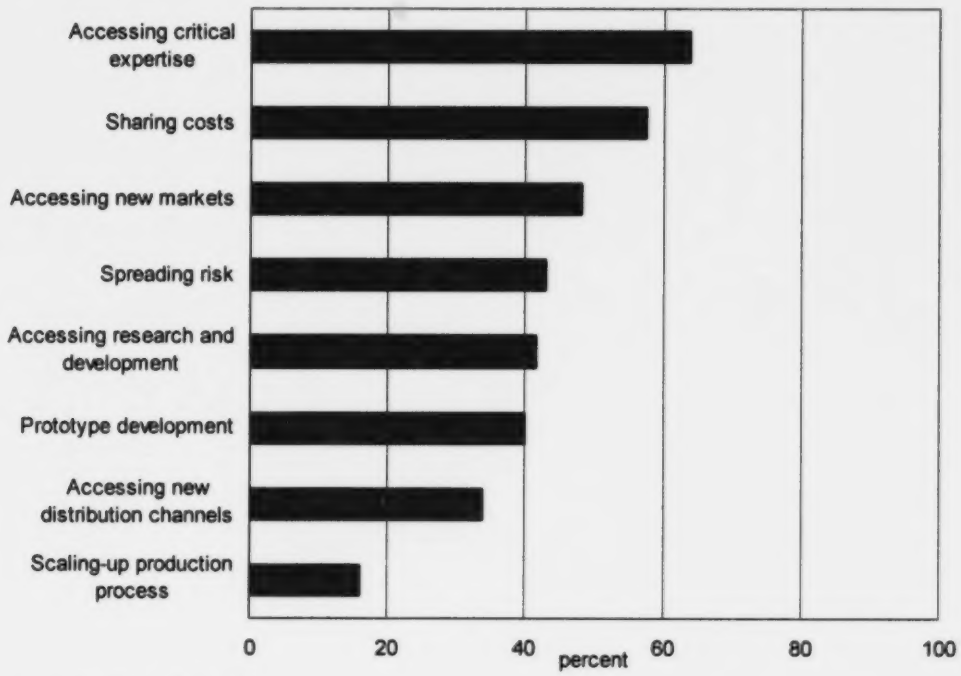
Figure 10
Percent of innovative establishments in selected ICT service industries involved in cooperative and collaborative arrangements, 2001 to 2003



Note: reliable data for "Other telecommunications" and "Web search portals" are not available due to confidentiality requirements but they do contribute to the estimate for Total ICT service industries.
Source: *Appendix II, table 8A*

Amongst innovative establishments in ICT services who reported engaging in co-operative or collaborative arrangements, more than half indicated they did so to access critical expertise or to share costs (Figure 11).

Figure 11
Objectives of collaboration of innovative establishments in selected ICT services industries involved in cooperative and collaborative arrangements, 2001 to 2003



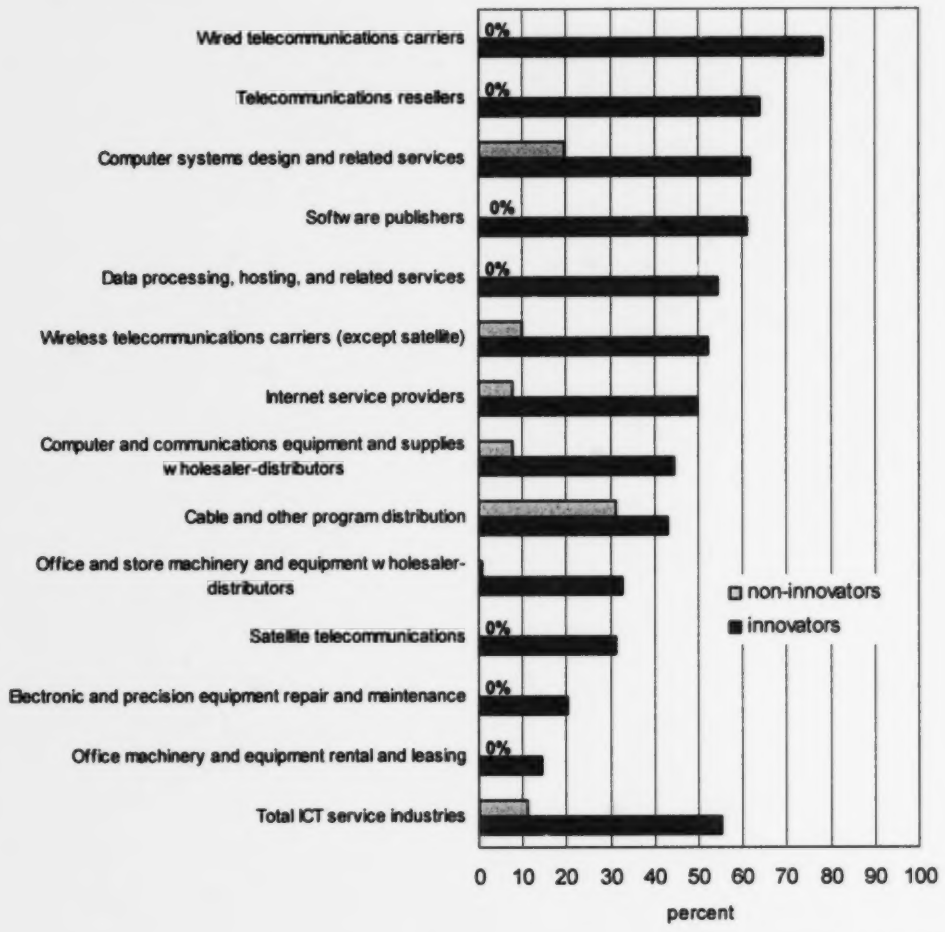
Source: *Appendix II, table 9A*

Not yet completed or abandoned innovation activities

Some establishments may attempt innovation but not complete the process of bringing the product to market or the process to the factory. The attempted innovation may be abandoned or not yet completed.

Overall, 55% of innovative establishments in ICT service industries indicated unsuccessful or not yet completed projects. The figure for non-innovative establishments was only 11%. The percentages of innovative establishments that indicated not yet completed or abandoned innovations ranged from 14% of innovative establishments in "Office machinery and equipment rental and leasing" to 62% of innovative establishments in "Computer systems design and related services". By contrast, far fewer non-innovative establishments in each of the ICT service industries indicated that they had attempted to undertake innovation projects (Figure 12).

Figure 12
Percentage of establishments with unsuccessful or not yet completed projects to develop or introduce new or significantly improved products or processes, 2001 to 2003


Wired telecommunications carriers
Telecommunications resellers
Computer systems design and related services
Softw are publishers
Data processing, hosting, and related services
Wireless telecommunications carriers (except satellite)
Internet service providers
Computer and communications equipment and supplies w holesaler-distributors
Cable and other program distribution
Office and store machinery and equipment w holesaler-distributors
Satellite telecommunications
Electronic and precision equipment repair and maintenance
Office machinery and equipment rental and leasing
Total ICT service industries
0%
non-innovators
innovators
0 10 20 30 40 50 60 70 80 90 100
percent

Note: reliable data for "Other telecommunications" and "Web search portals" are not available due to confidentiality requirements but they do contribute to the estimate for Total ICT service industries.
Source: *Appendix II, table 10A*

3. What are the obstacles to innovation and the support programs for innovation?

This section will examine the problems and obstacles faced by firms who engaged in innovative activities. Engaging in innovation activities requires the allocation of resources, both human and financial, by the establishment. Obstacles to innovation can include a lack of such resources and perceived risk with respect to feasibility or market success.

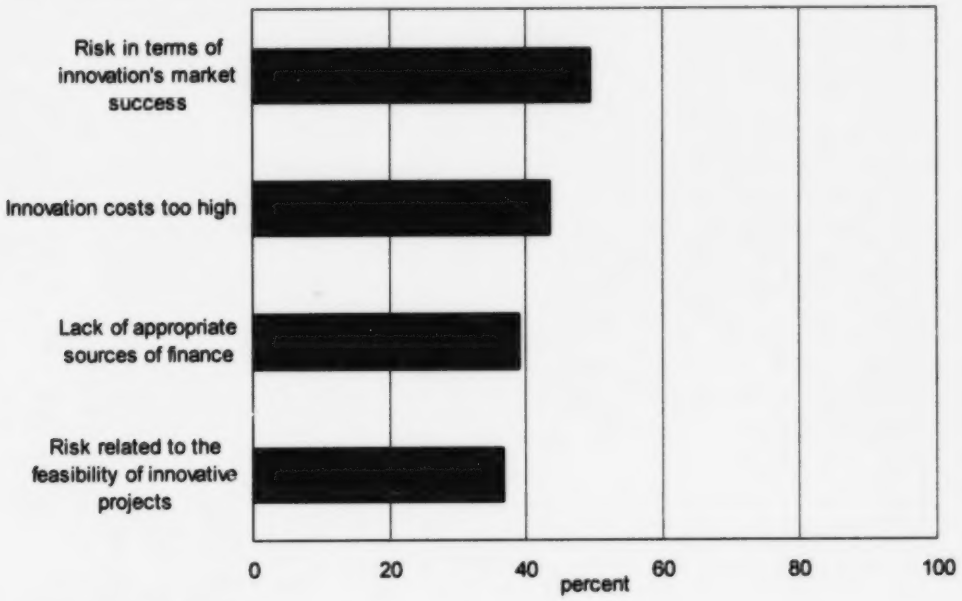
Federal and provincial governments provide a variety of support programs to promote innovation activities. These support programs are intended to help overcome some of the obstacles to innovation, such as the perceived risks of innovation, the difficulty in finding trained staff to undertake innovation activities and the costs involved in innovation activities.

Obstacles to innovation

Economic factors

Economic factors were more frequently indicated as important problems or obstacles than either internal or other factors. The most frequently indicated problem or obstacle to innovation was risk in terms of the innovation's market success, followed by innovation costs too high (Figure 13).

Figure 13
Percentage of innovative establishments indicating economic factors were important[13] problems and obstacles to innovation, 2001 to 2003



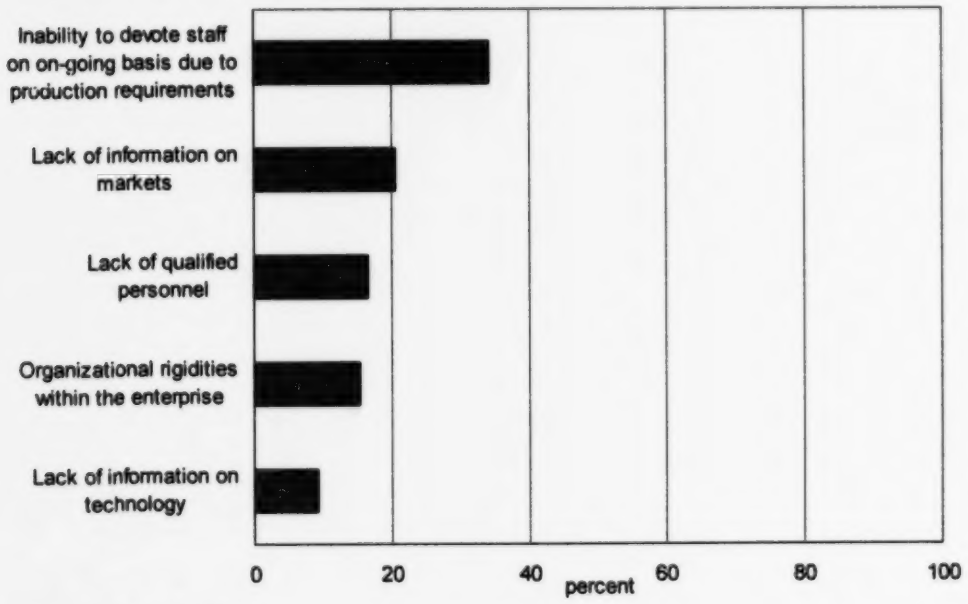
Source: *Appendix II, table 11A*

13. Respondents were asked to indicate the importance using a scale of 1 to 5, where 1 is low importance and 5 is high importance. "Important" in the descriptive text portion of this document indicates a response of "4" or "5". In the tables that follow, "High" indicates a response of "5" and "Moderately high" indicates a response of "4". Respondents could also indicate "0", which indicated the factor was not relevant.

Internal factors

With respect to factors internal to the firm, the most frequently indicated problem or obstacle to innovation was the inability to devote staff on an on-going basis due to production requirements (Figure 14).

Figure 14
Percentage of innovative establishments indicating internal factors were important[14] problems and obstacles to innovation, 2001 to 2003



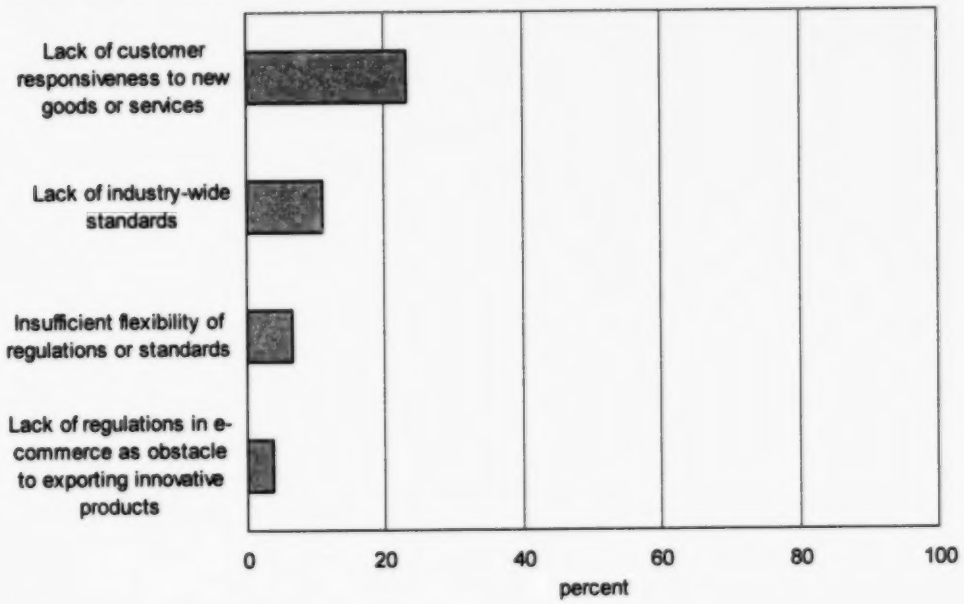
Source: *Appendix II, table 11A*

14. Respondents were asked to indicate the importance using a scale of 1 to 5, where 1 is low importance and 5 is high importance. "Important" in the descriptive text portion of this document indicates a response of "4" or "5". In the tables that follow, "High" indicates a response of "5" and "Moderately high" indicates a response of "4". Respondents could also indicate "0", which indicated the factor was not relevant.

Other factors

The most common "other" factor was lack of customer responsiveness to new goods or services, which was indicated as an important problem or obstacle to innovation by 23% of all innovative establishments in ICT service industries (Figure 15).

Figure 15
Percentage of innovative establishments indicating other factors were important[15] problems and obstacles to innovation during the period 2001 to 2003



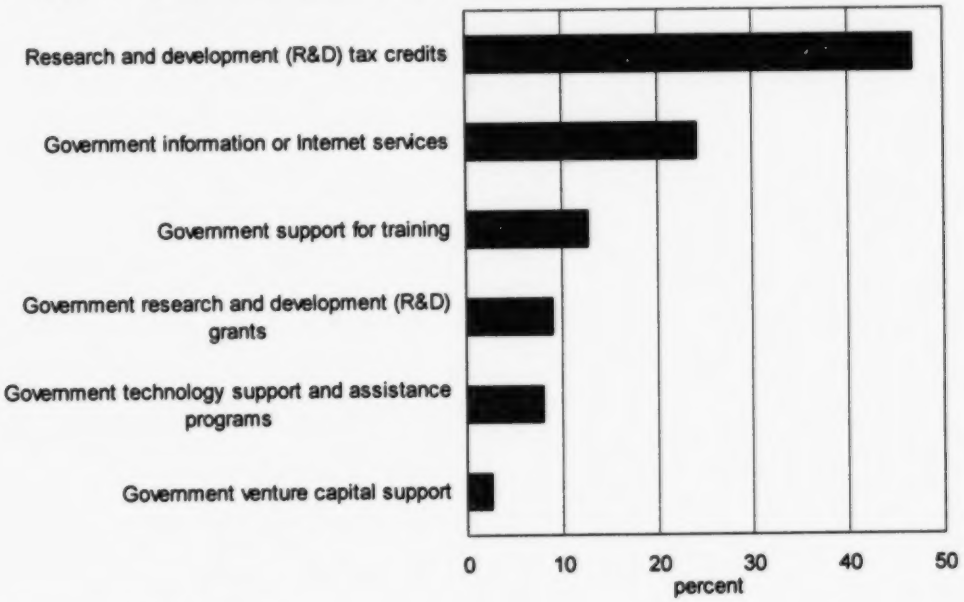
Source: *Appendix II, table 11A*

15 Respondents were asked to indicate the importance using a scale of 1 to 5, where 1 is low importance and 5 is high importance. "Important" in the descriptive text portion of this document indicates a response of "4" or "5". In the tables that follow, "High" indicates a response of "5" and "Moderately high" indicates a response of "4". Respondents could also indicate "0", which indicated the factor was not relevant.

Government Support Programs

Innovative establishments were asked to indicate their use of a variety of six government support programs: R&D tax credits, R&D grants, government venture capital support, government technology support and assistance, government information or Internet services and government support for training. R&D tax credits were the most frequently used government program for innovative establishments in ICT service industries followed by government Internet services (Figure 16).

Figure 16
Percent of innovative establishments indicating that they used government support programs during the period 2001 to 2003



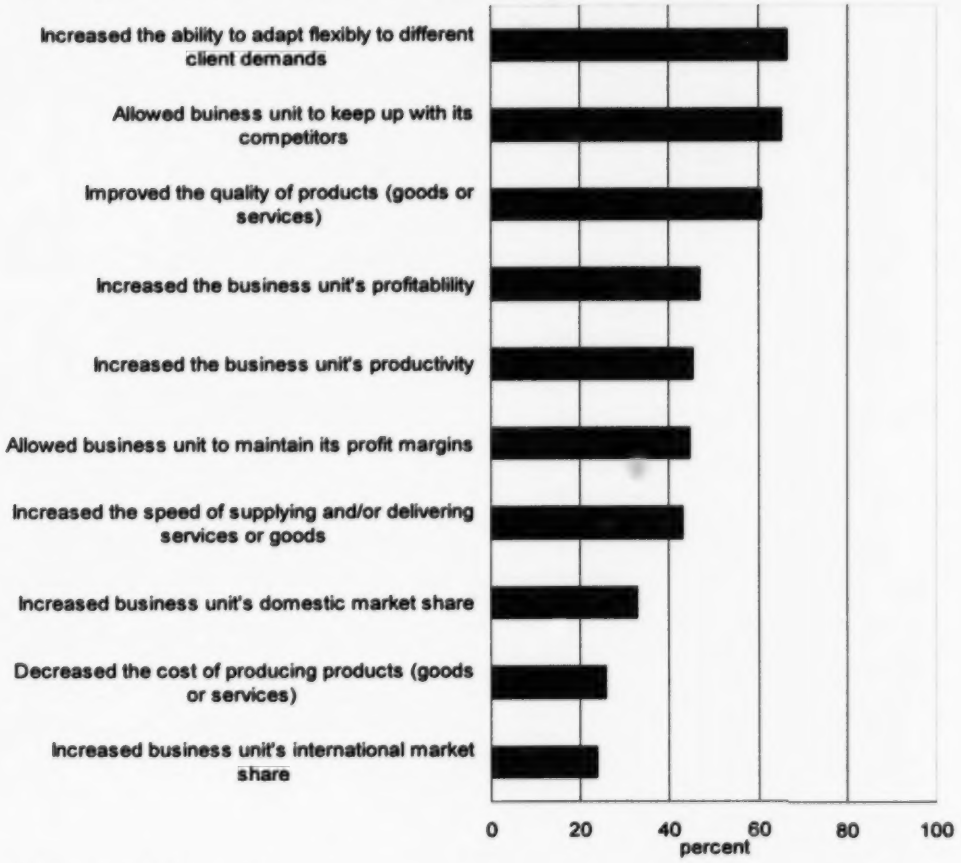
Source: *Appendix II, table 12A*

4. What are the impacts of innovation?

This section will examine the impacts of innovation. Innovative establishments were asked to indicate the importance of 10 possible impacts of innovation.

For innovative establishments in ICT service industries the most frequently indicated impacts of innovation were: the ability to adapt flexibly to different client demands, allowing firms to keep up with competitors and improved quality of products (goods or services) (Figure 17).

Figure 17
Percentage of innovative establishments indicating impacts[16] resulting from the development and introduction of innovations, 2001 to 2003


Increased the ability to adapt flexibly to different client demands
Allowed buiness unit to keep up with its competitors
Improved the quality of products (goods or services)
Increased the business unit's profitablility
Increased the business unit's productivity
Allowed business unit to maintain its profit margins
Increased the speed of supplying and/or delivering services or goods
Increased business unit's domestic market share
Decreased the cost of producing products (goods or services)
Increased business unit's international market share
0
20
40
60
80
100
percent

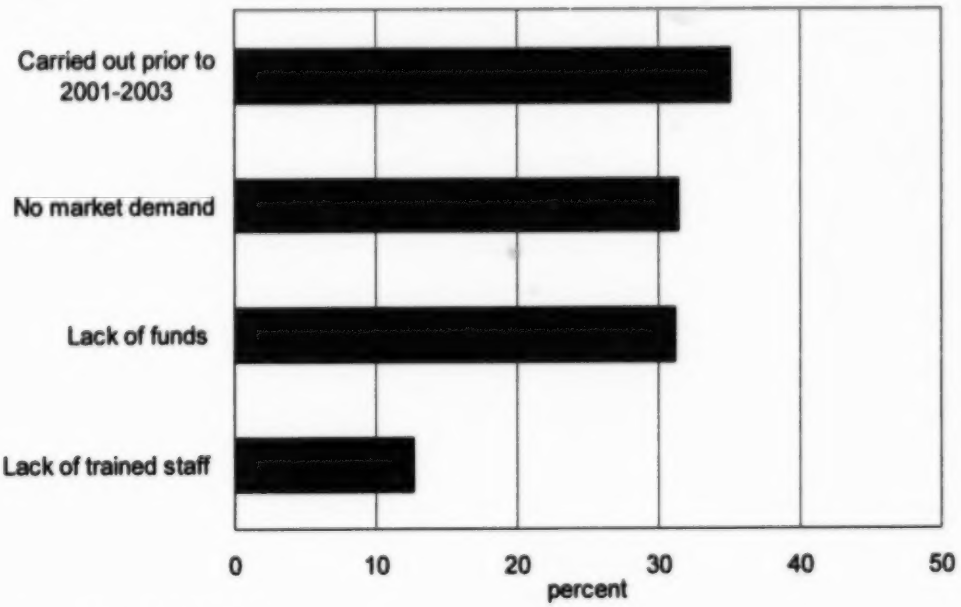
Source: *Appendix II, table 13A*

16. Establishments were asked whether or not they agreed with statements describing impacts of innovation. "Agree" indicates that they responded by selecting "4" or "5", while "Strongly agree" indicates that they selected "5" and "Not relevant" indicates that they selected "0".

5. Why do some establishments choose not to innovate?

Amongst non-innovative establishments in ICT service industries, 35% indicated they did not undertake innovation during the period 2001 to 2003 because they had carried out innovation activities prior to this period, followed by 31% who indicated lack of market demand or lack of funds for innovation (Figure 18).

Figure 18
Percent of non-innovative establishments indicating reason for not developing new or significantly improved products (goods or services) or processes, 2001 to 2003



Source: *Appendix II, table 14A*

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Appendix I: Description of the information and communication technology (ICT) sector services industries

All establishments and enterprises in Canada are defined according to a classification system called the North American Industrial Classification System (NAICS). This standard was revised in 2002, and it is this revised version that was used for the Survey of Innovation 2003.

NAICS 4173 - Computer and Communications Equipment and Supplies Wholesaler-Distributors -This industry group comprises establishments primarily engaged in wholesaling new and used computers, computer peripherals and pre-packaged computer software.

NAICS 41791 - Office and Store Machinery and Equipment Wholesaler-Distributors - This industry comprises establishments primarily engaged in wholesaling new and used office and store machinery and equipment furniture and fixtures.

NAICS 5112 - Software Publishers - This industry comprises establishments primarily engaged in publishing computer software, usually for multiple clients and generally referred to as packaged software. Establishments in this industry carry out operations necessary for producing and distributing computer software, such as designing, providing documentation, assisting in installation and providing support services to software purchasers. These establishments may design and publish, or publish only.

NAICS 5171 - Wired Telecommunications Carriers - This Canadian industry comprises establishments engaged in operating and maintaining network facilities for the transmission of voice, data, text, sound and full motion picture videos between network termination points. Transmission facilities may be based on a single technology or a combination of technologies.

NAICS 5172 - Wireless Telecommunications Carriers (except Satellite) - This Canadian industry comprises establishments engaged in operating and maintaining switching and transmission facilities to provide direct communications via the airwaves. Establishments that provide cellular phone services, paging services and personal communication services are included.

NAICS 5173 - Telecommunications Resellers - This Canadian industry comprises establishments engaged in purchasing access and network capacity from owners and operators of telecommunications networks and reselling telecommunications services to businesses, institutions or households. These establishments do not operate or maintain a full network.

NAICS 5174 - Satellite Telecommunications - This Canadian industry comprises establishments primarily engaged in operating and maintaining satellite telecommunications facilities for the transmission of voice, data, text, sound and full motion picture videos. Resellers of satellite communications are also included.

NAICS 5175 - Cable and Other Program Distribution - This Canadian industry comprises establishments primarily engaged in distributing television and radio programs, to subscribers, via cable or satellite distribution systems. These establishments deliver programming that originates from television and radio broadcasters, and pay and specialty channels. These establishments may also provide other services, such as interactive television, information services and tele-banking services.

NAICS 5179 - Other Telecommunications - This Canadian industry comprises establishments primarily engaged in providing specialized telecommunications services, such as satellite tracking, communications telemetry, and radar station operation. This industry also includes establishments primarily engaged in providing satellite terminal stations and associated facilities connected with one or more terrestrial systems and capable of transmitting telecommunications to, and receiving telecommunications from, satellite systems.

NAICS 518111 - Internet Service Providers - This Canadian industry comprises establishments known as Internet service providers. These establishments generally provide clients twenty-four hour connectivity at the client's residence or place of business and generally provide related services such as web hosting, web page designing, and hardware or software consulting related to Internet connectivity. Establishments in this industry may provide local, regional, or national coverage for clients or provide backbone services (except telecommunications carriers) for other Internet service providers. Internet service providers have the equipment and telecommunication network access required for a point-of-presence on the Internet.

NAICS 518112 - Web Search Portals - This Canadian industry comprises establishments primarily engaged in operating web search portals. Establishments in this industry operate web sites that use a search engine to generate and maintain extensive databases of Internet addresses and content in an easily searchable format. Web search portals often provide additional Internet services, such as e-mail, connections to other web sites, auctions, news, and other limited content, and serve as a home base for Internet users.

NAICS 5182 - Data Processing, Hosting, and Related Services - This Canadian industry comprises establishments primarily engaged in providing hosting or data processing services. Hosting establishments may provide specialized hosting activities, such as web hosting, streaming services or application hosting, or may provide general time-share mainframe facilities to clients. Data processing establishments may provide complete processing and preparation of reports from data supplied by the customer; specialized services, such as automated data entry; or they may make data processing resources available to clients on an hourly or time-sharing basis.

NAICS 53242 - Office Machinery and Equipment Rental and Leasing - This Canadian industry comprises establishments primarily engaged in renting or leasing office machinery and equipment.

NAICS 54151 - Computer System Design and Related Services- This industry comprises establishments primarily engaged in providing expertise in the field of information technologies through one or more activities, such as writing, modifying, testing and supporting software to meet the needs of a particular customer, including the creation of Internet home pages; planning and designing computer systems that integrate hardware, software and communication technologies; on-site management and operation of clients' computer and data processing facilities; providing advice in the field of information technologies; and other professional and technical computer-related services.

NAICS 8112 - Electronic and Precision Equipment Repair and Maintenance -This Canadian industry comprises establishments primarily engaged in repairing and maintaining electronic equipment and precision instruments.

Appendix II: Detailed Data Tables

The reliability of the data is reported using the following symbol convention (Tables A and B) for quality indicator interpretation. This convention combines the effect of sampling and the imputation rate.

Quality Indicators

Table A: Coefficient of Variation

	Imputation Rate			
CV	**< 15%**	**≥ 15% and < 35%**	**≥ 35% and < 50%**	**≥ 50%**
≤ 5.0%	A	B	E	F
> 5.0% and ≤ 15.0%	B	E	F	F
> 15.0% and ≤ 30.0%	E	F	F	F
> 30.0%	F	F	F	F

Table B: Standard Error

	Imputation Rate			
Standard Error	**< 15%**	**≥ 15% and < 35%**	**≥ 35% and < 50%**	**≥ 50%**
≤2.5%	A	B	E	F
>2.5% and ≤7.5%	B	E	F	F
>7.5 and ≤15.0%	E	F	F	F
>15.0%	F	F	F	F

Estimates with a quality indicator of A are very reliable.
Estimates with a quality indicator of B are reliable.
Estimates with a quality indicator of E are to be used with caution.
Estimates with a quality indicator of F have very poor reliability and have been suppressed.

Measures of importance and agreement

For Tables 4, 11 and13, establishments were asked to indicate the importance of various factors in question, be it sources of information, problems and obstacles, etc. Respondents were asked to indicate the importance using a scale of 1 to 5, where 1 is low importance and 5 is high importance. "Important" in the descriptive text portion of this document indicates a response of "4" or "5". In the tables that follow, "High" indicates a response of "5" and "Moderately high" indicates a response of "4". Respondents could also indicate "0", which indicated the factor was not relevant.

For Table 13, establishments were asked whether or not they agreed with statements describing impacts of innovation. "Agree" indicates that they responded by selecting "4" or "5", while "Strongly agree" indicates that they selected "5" and "Not relevant" indicates that they selected "0".

Statistical Unit

The questionnaire was directed to establishments. "The establishment is the level at which the accounting data required to measure production is available (principal inputs, revenues, salaries and wages). The establishment, as a statistical unit, is defined as the most homogeneous unit of production for which the business maintains accounting records from which it is possible to assemble all the data elements required to compile the full structure of the gross value of production (total sales or shipments, and inventories), the cost of materials and services, and labour and capital used in production."[17] In the questionnaire, establishments were referred to as "business units" as this terminology was found to be more familiar to respondents completing the survey. Establishments were also asked whether or not they belonged to larger firms, which corresponds to the statistical concept of the enterprise.

Note: A complete set of tables, comprising over one thousand tables presenting the results of the Survey of Innovation, 2003, for Canada and all provinces and territories is available on a CD-ROM entitled *Survey of Innovation 2003: Statistical Tables for Selected Service Industries*, catalogue number 88-524-XCB.

17. Source: http://www.statcan.ca/english/concepts/stat-unit-def.htm

Table 1A: Percentage of innovative establishments, 2001 to 2003

	Innovators	
	%	Reliability
Total ICT service industries	**78.2**	**A**
Computer and communications equipment and supplies wholesaler-distributors	65.1	B
Office and store machinery and equipment wholesaler-distributors	61.8	B
Software publishers	94.3	A
Wired telecommunications carriers	75.4	B
Wireless telecommunications carriers (except satellite)	60.0	B
Telecommunications resellers	74.5	E
Satellite telecommunications	100.0	A
Cable and other program distribution	66.5	B
Other telecommunications	x	A
Internet service providers	75.4	B
Web search portals	x	B
Data processing, hosting, and related services	72.4	B
Office machinery and equipment rental and leasing	52.6	B
Computer systems design and related services	87.2	B
Electronic and precision equipment repair and maintenance	53.3	B

Table 2A: Percentage of types of innovative establishments, 2001 to 2003

	Innovators		Product Innovators		Process Innovators	
	%	Reliability	%	Reliability	%	Reliability
Total ICT service industries	100.0	A	91.2	A	56.4	B
Computer and communications equipment and supplies wholesaler-distributors	100.0	A	86.0	B	57.3	B
Office and store machinery and equipment wholesaler-distributors	100.0	A	91.1	B	69.1	B
Software publishers	100.0	A	93.4	B	62.9	B
Wired telecommunications carriers	100.0	A	96.5	A	80.2	B
Wireless telecommunications carriers (except satellite)	100.0	A	90.7	B	81.9	B
Telecommunications resellers	100.0	A	100.0	A	39.5	E
Satellite telecommunications	100.0	A	88.9	B	73.7	B
Cable and other program distribution	100.0	A	100.0	A	64.4	B
Other telecommunications	x	A	x	A	x	A
Internet service providers	100.0	A	96.0	A	81.1	B
Web search portals	x	A	x	A	x	A
Data processing, hosting, and related services	100.0	A	81.0	B	88.1	B
Office machinery and equipment rental and leasing	100.0	A	85.4	E	71.7	E
Computer systems design and related services	100.0	A	92.4	A	48.2	B
Electronic and precision equipment repair and maintenance	100.0	A	71.8	B	62.7	B

Table 2A (con't): Percentage of types of innovative establishments, 2001 to 2003

	Both Product and Process Innovators		Product Innovators Only		Process Innovators Only	
	%	Reliability	%	Reliability	%	Reliability
Total ICT service industries	47.6	B	43.6	B	8.8	A
Computer and communications equipment and supplies wholesaler-distributors	43.3	B	42.7	B	14.0	B
Office and store machinery and equipment wholesaler-distributors	60.3	E	30.9	B	8.9	B
Software publishers	56.3	B	37.1	B	6.6	B
Wired telecommunications carriers	76.7	B	19.8	B	3.5	A
Wireless telecommunications carriers (except satellite)	72.6	B	18.1	B	9.3	B
Telecommunications resellers	39.5	E	60.5	E	0.0	A
Satellite telecommunications	62.7	B	26.3	B	11.1	B
Cable and other program distribution	64.4	B	35.6	B	0.0	A
Other telecommunications	x	A	x	A	x	A
Internet service providers	77.1	B	18.9	B	4.0	A
Web search portals	x	A	x	A	x	A
Data processing, hosting, and related services	69.0	B	11.9	B	19.0	B
Office machinery and equipment rental and leasing	57.1	E	28.3	E	14.6	E
Computer systems design and related services	40.6	B	51.8	B	7.6	A
Electronic and precision equipment repair and maintenance	34.4	B	37.3	B	28.2	B

Table 3A: Novelty of new or significantly improved products (goods or services) and/or processes, 2001 to 2003

	First in Canada		World first	
	%	Reliability	%	Reliability
Total ICT service industries	**39.9**	**B**	**20.9**	**B**
Computer and communications equipment and supplies wholesaler-distributors	34.5	B	14.9	B
Office and store machinery and equipment wholesaler-distributors	25.8	E	18.0	E
Software publishers	49.9	B	28.9	B
Wired telecommunications carriers	51.0	E	0.0	A
Wireless telecommunications carriers (except satellite)	16.3	B	6.9	B
Telecommunications resellers	54.2	E	0.0	A
Satellite telecommunications	62.7	B	11.1	B
Cable and other program distribution	35.8	B	0.0	A
Other telecommunications	x	A	x	A
Internet service providers	33.4	B	9.1	B
Web search portals	x	A	x	A
Data processing, hosting, and related services	26.5	B	14.3	B
Office machinery and equipment rental and leasing	42.9	E	0.0	A
Computer systems design and related services	43.7	B	25.1	B
Electronic and precision equipment repair and maintenance	17.9	B	17.9	B

Table 4A - Percentage of total ICT services innovative establishments indicating importance sources of information needed for suggesting or contributing to the development of innovation, 2001 to 2003

	Moderately high		High		Not relevant	
	%	Reliability	%	Reliability	%	Reliability
Internal sources of information for business unit						
Research and development staff	25.1	B	37.1	B	17.6	A
Marketing staff	34.2	B	24.1	A	5.5	A
Production staff	29.2	B	6.3	A	23.0	B
Management staff	34.9	B	28.9	B	3.7	A
Other business units in firm	10.8	A	9.1	A	43.7	B
External sources of information for business unit						
Suppliers of software, hardware, materials, or equipment	31.4	B	15.6	A	8.7	A
Clients or customers	34.2	B	47.2	B	2.1	A
Consultancy firms	7.9	A	4.1	A	24.7	B
Competitors and other enterprises from same industry	24.5	B	9.4	A	6.0	A
Universities or other higher education institutes	4.6	A	1.6	A	26.9	B
Federal government research laboratories	1.8	A	0.5	A	39.9	B
Provincial/territorial government research laboratories	0.3	A	0.7	A	43.9	B
Private non-profit research laboratories	1.0	A	0.5	A	41.7	B
Generally available sources of information for business unit						
Professional conferences, meetings, journals	26.5	B	15.8	A	6.8	A
Trade fairs and exhibitions	22.9	B	17.7	B	5.5	A
Trade associations	17.6	B	6.7	A	13.4	A
Internet	33.3	B	29.1	B	3.9	A

Table 5A: Percentage of innovative establishments engaged in activities linked to product or process innovation, 2001 to 2003

	Internal R&D		External R&D		Acquisition of equipment and machinery	
	%	Reliability	%	Reliability	%	Reliability
Total ICT service industries	**80.6**	**A**	**27.6**	**B**	**69.8**	**B**
Computer and communications equipment and supplies wholesaler-distributors	70.7	B	20.7	B	52.0	B
Office and store machinery and equipment wholesaler-distributors	35.8	E	32.5	E	49.1	E
Software publishers	87.8	B	37.8	B	73.8	B
Wired telecommunications carriers	87.1	B	37.5	E	80.2	B
Wireless telecommunications carriers (except satellite)	58.9	E	58.6	E	90.7	B
Telecommunications resellers	75.5	B	52.3	E	47.7	E
Satellite telecommunications	90.8	A	68.7	B	79.7	B
Cable and other program distribution	57.2	B	29.0	B	79.7	B
Other telecommunications	x	A	x	A	x	A
Internet service providers	91.7	B	34.4	B	85.7	B
Web search portals	x	A	x	A	x	A
Data processing, hosting, and related services	79.0	B	44.2	B	90.5	B
Office machinery and equipment rental and leasing	28.8	E	28.8	E	42.9	E
Computer systems design and related services	91.0	B	23.3	B	72.7	B
Electronic and precision equipment repair and maintenance	40.1	B	22.2	B	75.0	B

Table 5A (con't): Percentage of innovative establishments engaged in activities linked to product or process innovation, 2001 to 2003

	Acquisition of other external knowledge		Training		Market introduction of innovations	
	%	Reliability	%	Reliability	%	Reliability
Total ICT service industries	**47.6**	**B**	**77.5**	**B**	**75.9**	**B**
Computer and communications equipment and supplies wholesaler-distributors	54.6	B	81.0	B	76.4	B
Office and store machinery and equipment wholesaler-distributors	58.8	E	64.5	E	59.3	E
Software publishers	60.3	B	85.1	B	80.7	B
Wired telecommunications carriers	70.8	E	100.0	A	85.4	B
Wireless telecommunications carriers (except satellite)	74.2	B	95.4	B	78.7	B
Telecommunications resellers	42.5	E	78.8	E	93.1	B
Satellite telecommunications	31.3	B	90.8	A	62.7	B
Cable and other program distribution	40.4	B	79.8	B	55.4	B
Other telecommunications	x	A	x	A	x	A
Internet service providers	64.2	B	65.4	B	87.5	B
Web search portals	x	A	x	A	x	A
Data processing, hosting, and related services	64.3	B	97.6	A	67.4	B
Office machinery and equipment rental and leasing	71.2	E	71.7	E	42.9	E
Computer systems design and related services	39.4	B	75.4	B	78.5	B
Electronic and precision equipment repair and maintenance	42.3	B	75.0	B	56.1	E

Table 6A: Percentage of innovative establishments indicating where their product (goods or services) innovations that were introduced during the period 2001 to 2003 were developed

	Mainly within the business unit or the firm they are part of		In co-operation with other firms or organizations		Mainly other firms or organizations	
	%	Reliability	%	Reliability	%	Reliability
Total ICT service industries	**65.3**	**B**	**17.8**	**A**	**8.1**	**A**
Computer and communications equipment and supplies wholesaler-distributors	40.9	B	18.0	B	27.1	B
Office and store machinery and equipment wholesaler-distributors	20.4	B	53.1	E	17.6	B
Software publishers	83.1	B	10.3	B	0.0	A
Wired telecommunications carriers	61.4	E	15.2	B	19.8	B
Wireless telecommunications carriers (except satellite)	43.2	E	38.2	E	9.3	B
Telecommunications resellers	64.1	E	35.9	E	0.0	A
Satellite telecommunications	51.6	B	37.3	B	0.0	A
Cable and other program distribution	67.0	B	11.8	B	21.2	B
Other telecommunications	x	A	x	A	x	A
Internet service providers	51.7	B	26.6	B	17.7	B
Web search portals	x	A	x	A	x	A
Data processing, hosting, and related services	48.7	B	23.1	B	9.1	B
Office machinery and equipment rental and leasing	57.1	E	0.0	A	28.3	E
Computer systems design and related services	77.8	B	13.0	B	1.7	A
Electronic and precision equipment repair and maintenance	36.7	B	9.4	B	25.7	B

Table 7A: Percentage of innovative establishments indicating where their process innovations that were introduced during the period 2001 to 2003 were developed

	Mainly within the business unit or the firm they are part of		In co-operation with other firms or organizations		Mainly other firms or organizations	
	%	Reliability	%	Reliability	%	Reliability
Total ICT service industries	**40.1**	**B**	**9.3**	**A**	**6.9**	**A**
Computer and communications equipment and supplies wholesaler-distributors	39.8	B	12.7	B	4.7	B
Office and store machinery and equipment wholesaler-distributors	44.6	E	19.3	E	5.2	B
Software publishers	48.7	B	9.1	A	5.1	B
Wired telecommunications carriers	62.1	E	12.9	B	5.2	B
Wireless telecommunications carriers (except satellite)	33.4	E	39.1	E	9.3	B
Telecommunications resellers	39.5	E	0.0	A	0.0	A
Satellite telecommunications	62.7	B	11.1	B	0.0	A
Cable and other program distribution	36.2	B	28.2	B	0.0	A
Other telecommunications	x	A	x	A	x	A
Internet service providers	51.1	B	16.3	B	13.7	B
Web search portals	x	A	x	A	x	A
Data processing, hosting, and related services	49.5	B	26.7	B	11.9	B
Office machinery and equipment rental and leasing	28.8	E	0.0	A	42.9	E
Computer systems design and related services	37.4	B	3.3	A	7.5	B
Electronic and precision equipment repair and maintenance	25.1	B	27.5	B	10.1	B

Table 8A: Percentage of innovative establishments involved in cooperative and collaborative arrangements, 2001 to 2003

	%	Reliability
Total ICT service industries	**55.0**	**B**
Computer and communications equipment and supplies wholesaler-distributors	40.8	B
Office and store machinery and equipment wholesaler-distributors	50.2	E
Software publishers	65.7	B
Wired telecommunications carriers	85.4	B
Wireless telecommunications carriers (except satellite)	30.0	B
Telecommunications resellers	53.9	E
Satellite telecommunications	71.9	E
Cable and other program distribution	26.7	B
Other telecommunications	x	A
Internet service providers	57.8	B
Web search portals	x	A
Data processing, hosting, and related services	66.3	B
Office machinery and equipment rental and leasing	43.4	E
Computer systems design and related services	57.3	B
Electronic and precision equipment repair and maintenance	62.0	B

Table 9A: Percentage of total ICT services innovative establishments in cooperative or collaborative arrangements indicating reasons for collaboration, 2001 to 2003

	%	Reliability
Sharing costs	57.5	B
Spreading risk	42.9	B
Accessing research and development	41.5	B
Prototype development	40.0	B
Scaling-up production process	16.0	B
Accessing critical expertise	63.8	B
Accessing new markets	48.2	B
Accessing new distribution channels	33.7	B

Table 10A: Percentage of establishments with unsuccessful or not yet completed projects to develop or introduce new or significantly improved products (goods or services) or processes (including improved ways of delivering goods or services), 2001 to 2003

	All		Innovators		Non-innovators	
	%	Reliability	%	Reliability	%	Reliability
Total ICT service industries	**45.6**	**B**	**55.2**	**B**	**11.2**	**B**
Computer and communications equipment and supplies wholesaler-distributors	31.8	B	44.6	B	7.9	B
Office and store machinery and equipment wholesaler-distributors	20.6	B	32.7	E	0.9	A
Software publishers	60.6	B	60.9	B	x	F
Wired telecommunications carriers	59.2	E	78.4	B	x	A
Wireless telecommunications carriers (except satellite)	35.3	B	52.2	E	9.9	B
Telecommunications resellers	58.6	E	64.1	E	x	F
Satellite telecommunications	31.3	B	31.3	B	...	...
Cable and other program distribution	39.1	B	43.0	B	31.4	E
Other telecommunications	x	A	x	A	x	A
Internet service providers	39.5	B	49.7	B	7.9	B
Web search portals	x	B	x	A	x	A
Data processing, hosting, and related services	39.3	B	54.3	B	0.0	A
Office machinery and equipment rental and leasing	7.4	B	14.2	B	0.0	A
Computer systems design and related services	56.3	B	61.7	B	19.6	E
Electronic and precision equipment repair and maintenance	10.7	B	20.1	B	0.0	A

Table 11A: Percentage of innovative establishments with problems and obstacles that slowed down or caused problems when developing new or significantly improved products (goods or services) or processes (including improved ways of delivering goods or services), 2001 to 2003

	Importance					
	Moderately high		High		Not relevant	
	%	Reliability	%	Reliability	%	Reliability
Economic factors						
Risk related to the feasibility of innovative projects	26.3	B	10.4	A	11.6	A
Risk in terms of innovation's market success	33.0	B	16.5	A	13.1	A
Innovation costs too high	30.2	B	13.4	A	14.6	A
Lack of appropriate sources of finance	15.5	A	23.5	B	19.2	B
Internal factors						
Organizational rigidities within the enterprise	8.3	A	7.0	A	23.5	B
Inability to devote staff on on-going basis due to production requirements	21.1	B	13.1	A	13.2	A
Lack of qualified personnel	12.7	A	3.9	A	10.3	A
Lack of information on technology	6.3	A	2.8	A	15.9	A
Lack of information on markets	14.9	A	5.6	A	12.0	A
Other factors						
Insufficient flexibility of regulations or standards	3.6	A	3.0	A	33.4	B
Lack of customer responsiveness to new goods or services	18.1	A	5.2	A	14.0	A
Lack of industry-wide standards	7.9	A	3.0	A	30.3	B
Lack of regulations in e-commerce as obstacle to exporting innovative products	3.2	A	0.5	A	37.7	B

Table 12A: Percentage of innovative establishments that used programs sponsored by the federal or provincial/territorial governments, 2001 to 2003

	Government programs				Did not use government program	
	Federal government		Provincial/territorial government			
	%	Reliability	%	Reliability	%	Reliability
Research and development (R&D) tax credits	44.0	E	33.7	E	53.3	E
Government research and development (R&D) grants	7.3	B	4.1	B	91.0	B
Government venture capital support	1.8	B	1.1	B	97.4	B
Government technology support and assistance programs	6.9	B	2.4	B	92.0	B
Government information or Internet services	22.0	E	15.0	B	75.8	E
Government support for training	3.8	B	10.5	B	87.3	B
Other government support programs	2.9	B	4.1	B	93.5	B

Table 13A: Percentage of innovative establishments indicating an impact from new or significantly improved products (goods or services) or processes (including improved ways of delivering goods or services) developed and introduced, 2001 to 2003

	Agree		Strongly agree		Not relevant	
	%	Reliability	%	Reliability	%	Reliability
Increased the business unit's productivity	45.2	B	14.6	A	17.2	A
Increased the business unit's profitability	46.9	B	14.2	A	5.1	A
Increased the speed of supplying and/or delivering services or goods	43.0	B	15.8	B	20.7	B
Increased the ability to adapt flexibly to different client demands	66.6	B	27.4	B	8.7	A
Increased business unit's domestic market share	32.9	B	9.9	A	15.6	A
Increased business unit's international market share	23.8	B	11.2	A	37.4	B
Allowed business unit to maintain its profit margins	44.8	B	16.5	A	11.8	A
Allowed business unit to keep up with its competitors	65.2	B	30.2	B	8.3	A
Decreased the cost of producing products (goods or services)	25.7	B	9.0	A	18.1	A
Improved the quality of products (goods or services)	60.9	B	23.8	B	14.4	B

Table 14A: Reasons why non-innovative establishments did not develop or introduce any new or significantly improved products (goods or services) or processes, 2001 - 2003

	Carried out prior to 2001-2003		No market demand		Lack of funds		Lack of trained staff	
	%	Reliability	%	Reliability	%	Reliability	%	Reliability
Total ICT service industries	35.1	E	31.4	E	31.1	E	12.7	B
Computer and communications equipment and supplies wholesaler-distributors	F	F	11.4	E	F	F	11.8	E
Office and store machinery and equipment wholesaler-distributors	F	F	F	F	F	F	18.3	E
Software publishers	x	F	x	F	x	F	x	B
Wired telecommunications carriers	x	B	x	F	x	B	x	B
Wireless telecommunications carriers (except satellite)	7.0	E	0.0	B	16.9	E	0.0	B
Telecommunications resellers	x	B	x	B	x	B	x	B
Satellite telecommunications	...	...	...	...	...	...	...	...
Cable and other program distribution	F	F	5.9	E	16.7	E	F	F
Other telecommunications	x	B	x	B	x	B	x	B
Internet service providers	F	F	F	F	86.0	E	F	F
Web search portals	x	B	x	B	x	B	x	B
Data processing, hosting, and related services	F	F	F	F	F	F	21.2	E
Office machinery and equipment rental and leasing	0.0	B	F	F	0.0	B	0.0	B
Computer systems design and related services	F	F	F	F	F	F	2.1	B
Electronic and precision equipment repair and maintenance	26.1	E	30.4	E	42.3	E	23.8	E

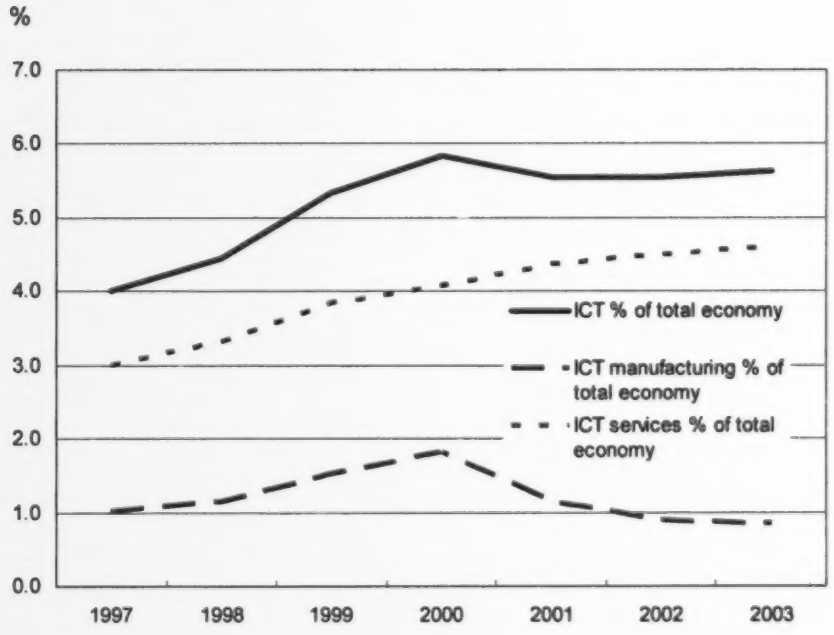
Appendix III: Overview of the ICT sector

The ICT sector, as defined by international agreement, is composed of 23 four- and five-digit NAICS 2002 industries. Fifteen of these industries make up the ICT service sector, all of which were included in the Survey of Innovation 2003.

ICT services and GDP

The ICT sector's share of total economy GDP increased over the 1997-2003 period, peaking in 2000 and then dipping slightly to rest at 5.6% of total GDP in 2003. (Figure 1A). The proportion of ICT manufacturing rose in the late 1990s but then declined substantially in the early years of the new millennium. By 2003, the ICT manufacturing sector accounted for just 0.8% of total economy GDP, down from its share of 1.0% in 1997. ICT service industries, by contrast, reported steady growth throughout the period. In 1997, the ICT services component accounted for 75% of ICT sector value-added; by 2003, it was 82%.

Figure 1A
ICT industries as a proportion of GDP, 1997 to 2003

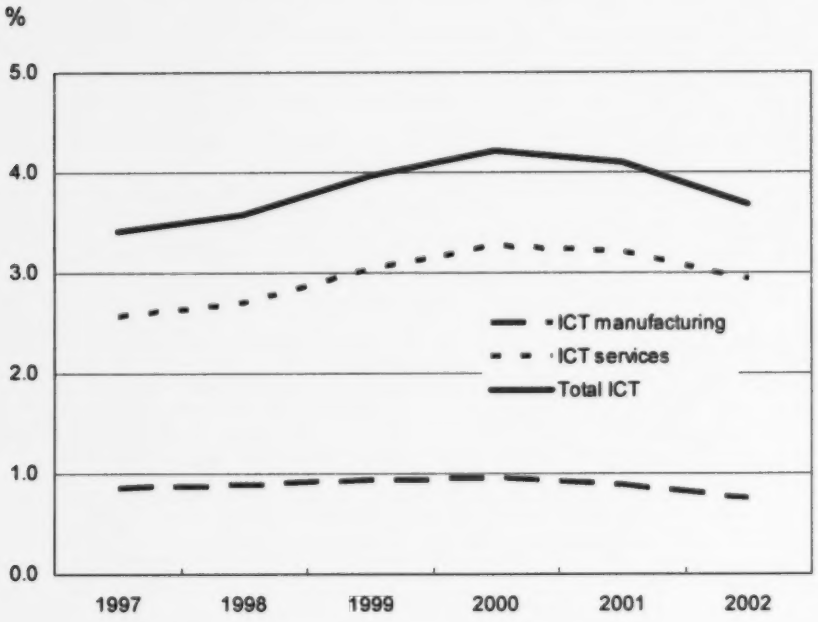


Source: *Statistics Canada*

ICT services employment

Employment in the ICT sector accounted for 3.7% of total economy employment in 2002. ICT service industries accounted for the majority of ICT sector employment (80%) and all of the growth in ICT employment as a percentage of total employment, between 1997 and 2002 (Figure 2A).

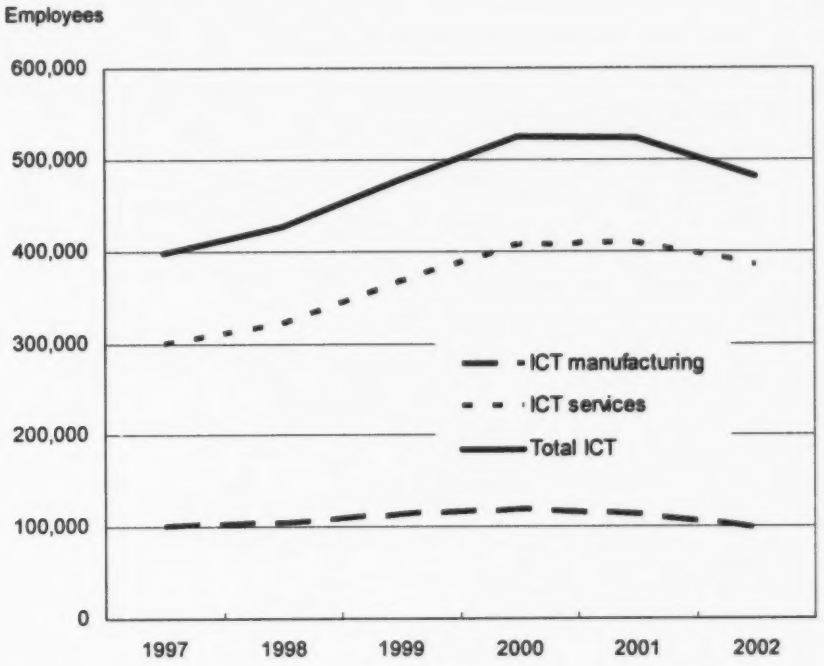
Figure 2A
ICT employment as a proportion of total employment, 1997-2002



Source: *Statistics Canada*

Employment in ICT manufacturing peaked in 2000, while in ICT services, it peaked a year later. Since 2000, nearly 43,500 jobs have been lost in the ICT sector, with slightly more of the losses stemming from ICT service industries (Figure 3A). Overall, however, there has been a net increase in employment in ICT services of about 85,500 jobs between 1997 and 2002, while there has been a net decline in ICT manufacturing employment of about 2,000 jobs.

Figure 3A
ICT sector employment, 1997-2002



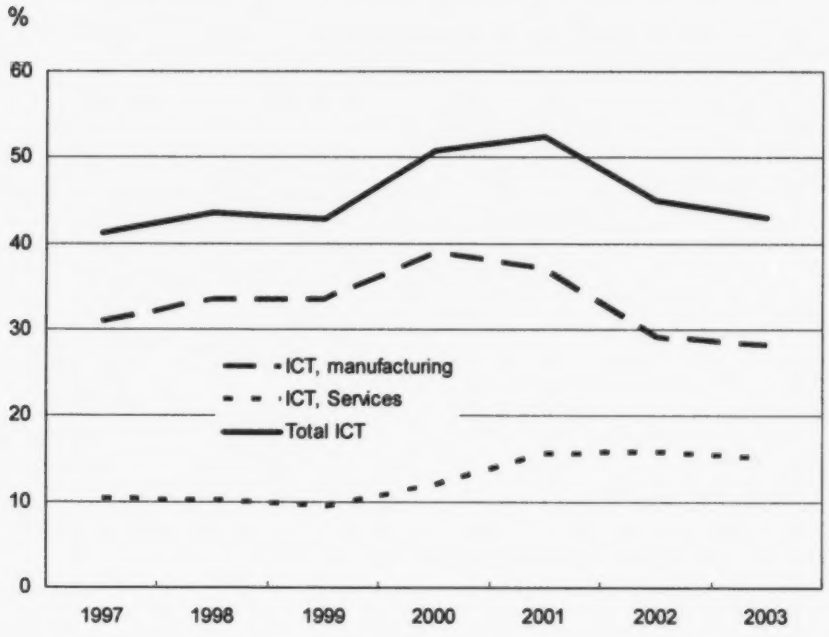
Source: *Statistics Canada*

ICT services R&D

ICT is, and has been, one of the major areas of industrial R&D in Canada. A total of 24 six-digit NAICS industries comprise the entire ICT sector. Of these, eight are in manufacturing and 16 are in the service sector. The sixteen service industries are the industries that were included in the Survey of Innovation 2003. Together, the ICT sector industries accounted for 41% of industrial R&D in 2003 (Figure 4A). This is down from its substantial share of 51% in 2001.

R&D spending in ICT service industries accounted for about almost one-quarter (23%) of total ICT sector R&D in 1997, but by 2003 it accounted for just under one-third (32%). In the interval 1994 to 2000, ICT services accounted for about 10% of all industrial R&D. From 2001 onward, the figure is around 13%.

Figure 4A
ICT sector R&D as a proportion of total industrial R&D, 1997-2003



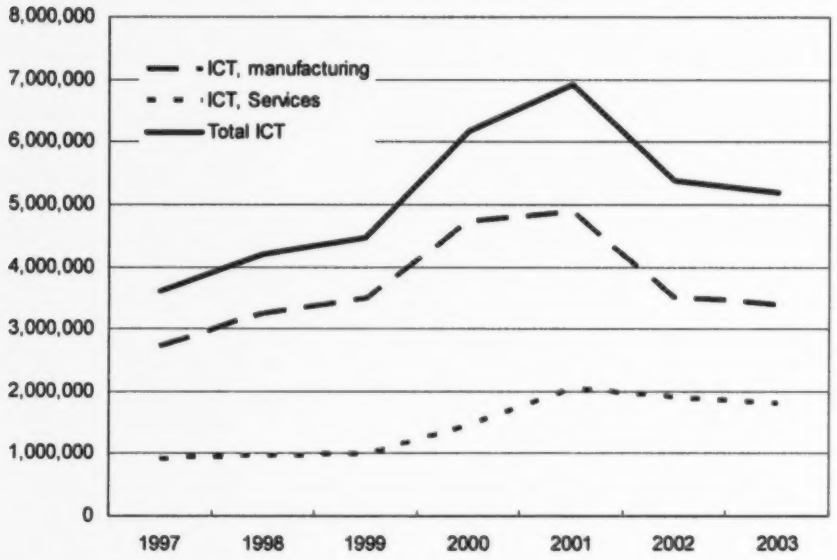
Source: *Statistics Canada, Research and Development in Canadian Industry (RDCI database)*

ICT sector R&D spending peaked in 2001, having increased throughout the mid to late 1990s (Figure 5A). During the 1990s, it was the manufacturing sector of ICT R&D that drove overall increases. Between 1999 and 2001, both the manufacturing and services sectors registered rapid growth in R&D spending. After 2001, however, R&D in ICT manufacturing dropped back to just above 1999 levels. R&D spending in the ICT service sector was stable, remaining at the level reached during the boom.

Nevertheless, the ICT sector remains the largest component of industrial R&D spending, followed by pharmaceuticals and transportation equipment manufacturing[18].

Figure 5A
ICT R&D spending, 1997-2003

($,000 current value)



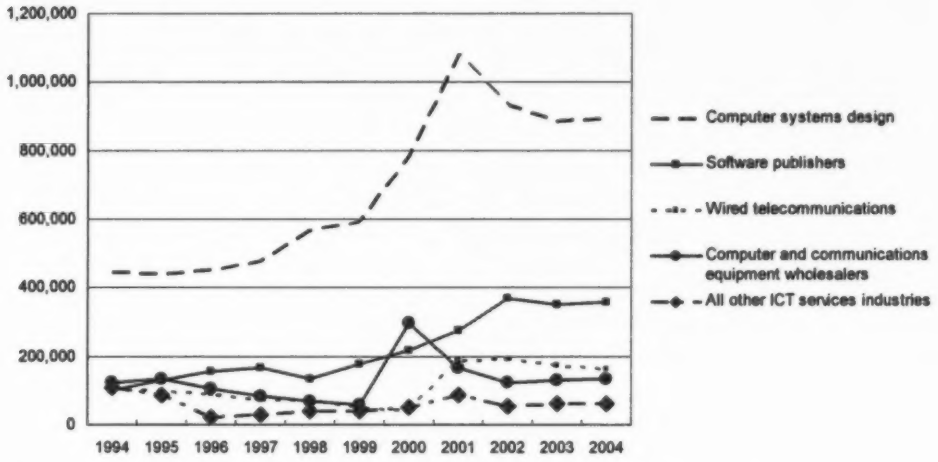
Source: *Statistics Canada, Research and Development in Canadian Industry (RDCI database)*

18. Statistics Canada (2005a), *Industrial Research and Development Intentions, 2004 Intentions*, Cat. No. 88-202-XIE. Ottawa: Statistics Canada

In 2003, the major R&D performing industries in ICT services were "Computer and communications equipment wholesalers", at $130 million, "Software publishers", at $350 million and "Computer systems design", at $885 million (Figure 6A). On the hardware side, five of the eight five-digit industries reported $100 million or more in industrial R&D[19].

Figure 6A
R&D by major R&D performing industries in ICT services, 1994-2004

($,000s current value)



Source: *Statistics Canada, Research and Development in Canadian Industry (RDCI database)*

19. Statistics Canada (2005a), Research and Development in Canadian Industry, 2004, Cat. No. 88-202-XIE. Ottawa: Statistics Canada

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Volume 29

No. 1 Distribution of federal expenditures on science and technology by province and territories, 2002-2003 (January 2005)

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No. 3 Biotechnology scientific activities in federal government departments and agencies, 2003-2004 (May 2005)

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Volume 28

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No. 3 Distribution of federal expenditures on science and technology, by province and territories, 2001-2002 (February 2004)

No. 4 Research and development (R&D) expenditures of private non-profit (PNP) organizations, 2002 (April 2004)

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